

Lancaster, NH - Guildhall, VT 16155, A001(159)
US Route 2 (Rogers' Rangers) Bridge over the
Connecticut River
Standard Dredge and Fill Wetland Application

State of New Hampshire



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WETLANDS PERMIT APPLICATION

Water Division/ Wetlands Bureau Land Resources Management

Check the status of your application: www.des.nh.gov/onestop



RSA/Rule: [RSA 482-A/ Env-Wt 100-900](#)

Administrative Use Only	Administrative Use Only	Administrative Use Only	File No.:
			Check No.:
			Amount:
			Initials:

1. REVIEW TIME: Indicate your Review Time below. To determine review time, refer to [Guidance Document A](#) for instructions.

☒ Standard Review (Minimum, Minor or Major Impact)

☐ Expedited Review (Minimum Impact only)

2. MITIGATION REQUIREMENT:

If mitigation is required a Mitigation-Pre Application meeting must occur prior to submitting this Wetlands Permit Application. To determine if Mitigation is Required, please refer to the [Determine if Mitigation is Required Frequently Asked Question](#).

Mitigation Pre-Application Meeting Date: Month: ___ Day: ___ Year: ___

☐ N/A - Mitigation is not required

3. PROJECT LOCATION:

Separate wetland permit applications must be submitted for each municipality that wetland impacts occur within.

ADDRESS: **US Route 2**

TOWN/CITY: **Lancaster**

TAX MAP: **NA**

BLOCK: **NA**

LOT: **NA**

UNIT: **NA**

USGS TOPO MAP WATERBODY NAME: **Connecticut River**

☐ NA

STREAM WATERSHED SIZE: **1,243 SQ.MI**

☐ NA

LOCATION COORDINATES (If known): **44°29'46.01"N 71°35'40.64"W"**

☒ Latitude/Longitude

4. PROJECT DESCRIPTION:

Provide a brief description of the project outlining the scope of work. Attach additional sheets as needed to provide a detailed explanation of your project. DO NOT reply "See Attached" in the space provided below.

The NH Department of Transportation (NHDOT) proposes to replace bridge 111/129, carrying US Route 2 over the Connecticut River in Lancaster, NH to Guildhall, VT (Exhibit A - Location Map). The replacement structure will accommodate two 12-foot lanes of traffic (one in each direction) with two five-foot shoulders and one ten-foot snowmobile path.

5. SHORELINE FRONTAGE:

☐ NA This does not have shoreline frontage.

SHORELINE FRONTAGE:

Shoreline frontage is calculated by determining the average of the distances of the actual natural navigable shoreline frontage and a straight line drawn between the property lines, both of which are measured at the normal high water line.

6. RELATED NHDES LAND RESOURCES MANAGEMENT PERMIT APPLICATIONS ASSOCIATED WITH THIS PROJECT:

Please indicate if any of the following permit applications are required and, if required, the status of the application.

To determine if other Land Resources Management Permits are required, refer to the [Land Resources Management Web Page](#).

Permit Type	Permit Required	File Number	Permit Application Status
Alteration of Terrain Permit Per RSA 485-A:17	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	_____	<input type="checkbox"/> APPROVED <input type="checkbox"/> PENDING <input type="checkbox"/> DENIED
Individual Sewerage Disposal per RSA 485-A:2	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	_____	<input type="checkbox"/> APPROVED <input type="checkbox"/> PENDING <input type="checkbox"/> DENIED
Subdivision Approval Per RSA 485-A	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	_____	<input type="checkbox"/> APPROVED <input type="checkbox"/> PENDING <input type="checkbox"/> DENIED
Shoreland Permit Per RSA 483-B	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	_____	<input type="checkbox"/> APPROVED <input type="checkbox"/> PENDING <input type="checkbox"/> DENIED

7. NATURAL HERITAGE BUREAU & DESIGNATED RIVERS:

See the Instructions & Required Attachments document for instructions to complete a & b below.

a. Natural Heritage Bureau File ID: NHB **18** - **1607**

b. ☒ [Designated River](#) the project is in ¼ miles of: **Connecticut River**; and
date a copy of the application was sent to the [Local River Management Advisory Committee](#): Month: ___ Day: ___ Year: ___
☐ N/A

lrn@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

8. APPLICANT INFORMATION (Desired permit holder)			
LAST NAME, FIRST NAME, M.I.: Adams, Joseph			
TRUST / COMPANY NAME: NHDOT		MAILING ADDRESS: 7 Hazen Drive	
TOWN/CITY: Concord		STATE: NH	ZIP CODE: 03302
EMAIL or FAX: Joseph.Adams@dot.nh.gov		PHONE: 603.271.1618	
ELECTRONIC COMMUNICATION: By initialing here: _____, I hereby authorize NHDES to communicate all matters relative to this application electronically.			
9. PROPERTY OWNER INFORMATION (If different than applicant)			
LAST NAME, FIRST NAME, M.I.:			
TRUST / COMPANY NAME:		MAILING ADDRESS:	
TOWN/CITY:		STATE:	ZIP CODE:
EMAIL or FAX:		PHONE:	
ELECTRONIC COMMUNICATION: By initialing here _____, I hereby authorize NHDES to communicate all matters relative to this application electronically.			
10. AUTHORIZED AGENT INFORMATION			
LAST NAME, FIRST NAME, M.I.: Chase, Vicki		COMPANY NAME: Normandeau Associates	
MAILING ADDRESS: 25 Nashua Road			
TOWN/CITY: Bedford		STATE: NH	ZIP CODE: 03110
EMAIL or FAX: vchase@normandeau.com		PHONE: 603 637-1111	
ELECTRONIC COMMUNICATION: By initialing here VPC , I hereby authorize NHDES to communicate all matters relative to this application electronically.			
11. PROPERTY OWNER SIGNATURE:			
See the Instructions & Required Attachments document for clarification of the below statements			
By signing the application, I am certifying that:			
<ol style="list-style-type: none"> 1. I authorize the applicant and/or agent indicated on this form to act in my behalf in the processing of this application, and to furnish upon request, supplemental information in support of this permit application. 2. I have reviewed and submitted information & attachments outlined in the Instructions and Required Attachment document. 3. All abutters have been identified in accordance with RSA 482-A:3, I and Env-Wt 100-900. 4. I have read and provided the required information outlined in Env-Wt 302.04 for the applicable project type. 5. I have read and understand Env-Wt 302.03 and have chosen the least impacting alternative. 6. Any structure that I am proposing to repair/replace was either previously permitted by the Wetlands Bureau or would be considered grandfathered per Env-Wt 101.47. 7. I have submitted a Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) to the NH State Historic Preservation Officer (SHPO) at the NH Division of Historical Resources to identify the presence of historical/ archeological resources while coordinating with the lead federal agency for NHPA 106 compliance. 8. I authorize NHDES and the municipal conservation commission to inspect the site of the proposed project. 9. I have reviewed the information being submitted and that to the best of my knowledge the information is true and accurate. 10. I understand that the willful submission of falsified or misrepresented information to the New Hampshire Department of Environmental Services is a criminal act, which may result in legal action. 11. I am aware that the work I am proposing may require additional state, local or federal permits which I am responsible for obtaining. 12. The mailing addresses I have provided are up to date and appropriate for receipt of NHDES correspondence. NHDES will not forward returned mail. 			
 Property Owner Signature		Print name legibly	/ / Date

MUNICIPAL SIGNATURES

12. CONSERVATION COMMISSION SIGNATURE

The signature below certifies that the municipal conservation commission has reviewed this application, and:

1. Waives its right to intervene per RSA 482-A:11;
2. Believes that the application and submitted plans accurately represent the proposed project; and
3. Has no objection to permitting the proposed work.

	Print name legibly	Date
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DIRECTIONS FOR CONSERVATION COMMISSION

1. Expedited review ONLY requires that the conservation commission's signature is obtained in the space above.
2. Expedited review requires the Conservation Commission signature be obtained **prior** to the submittal of the original application to the Town/City Clerk for signature.
3. The Conservation Commission may refuse to sign. If the Conservation Commission does not sign this statement for any reason, the application is not eligible for expedited review and the application will be reviewed in the standard review time frame.

13. TOWN / CITY CLERK SIGNATURE

As required by Chapter 482-A:3 (amended 2014), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.

	Print name legibly	Town/City	Date
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DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3,I

1. For applications where "Expedited Review" is checked on page 1, if the Conservation Commission signature is not present, NHDES will accept the permit application, but it will NOT receive the expedited review time.
2. IMMEDIATELY sign the original application form and four copies in the signature space provided above;
3. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
4. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board; and
5. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:

1. Submit the single, original permit application form bearing the signature of the Town/ City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery.

14. IMPACT AREA:

For each jurisdictional area that will be/has been impacted, provide square feet and, if applicable, linear feet of impact

Permanent: impacts that will remain after the project is complete.

Temporary: impacts not intended to remain (and will be restored to pre-construction conditions) after the project is complete.

JURISDICTIONAL AREA	PERMANENT Sq. Ft. / Lin. Ft.	TEMPORARY Sq. Ft. / Lin. Ft.
Forested wetland	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Scrub-shrub wetland	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Emergent wetland	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Wet meadow	<input type="checkbox"/> ATF	91 <input type="checkbox"/> ATF
Intermittent stream	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Perennial Stream / River	1,738 / 92 <input type="checkbox"/> ATF	35,772 / 214 <input type="checkbox"/> ATF
Lake / Pond	/ <input type="checkbox"/> ATF	/ <input type="checkbox"/> ATF
Bank - Intermittent stream	/ <input type="checkbox"/> ATF	/ <input type="checkbox"/> ATF
Bank - Perennial stream / River	527 / 47 <input type="checkbox"/> ATF	1,943 / 415 <input type="checkbox"/> ATF
Bank - Lake / Pond	/ <input type="checkbox"/> ATF	/ <input type="checkbox"/> ATF
Tidal water	/ <input type="checkbox"/> ATF	/ <input type="checkbox"/> ATF
Salt marsh	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Sand dune	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Prime wetland	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Prime wetland buffer	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Undeveloped Tidal Buffer Zone (TBZ)	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Previously-developed upland in TBZ	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Docking - Lake / Pond	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Docking - River	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Docking - Tidal Water	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
Vernal Pool	<input type="checkbox"/> ATF	<input type="checkbox"/> ATF
TOTAL	2,265 / 139	37,806 / 629

15. APPLICATION FEE: See the Instructions & Required Attachments document for further instruction

☐ Minimum Impact Fee: Flat fee of \$ 200

☐ Minor or Major Impact Fee: Calculate using the below table below

Permanent and Temporary (non-docking) 40,071 sq. ft. X \$0.20 = \$ 8,014.20

Temporary (seasonal) docking structure: sq. ft. X \$1.00 = \$

Permanent docking structure: sq. ft. X \$2.00 = \$

Projects proposing shoreline structures (including docks) add \$200 = \$

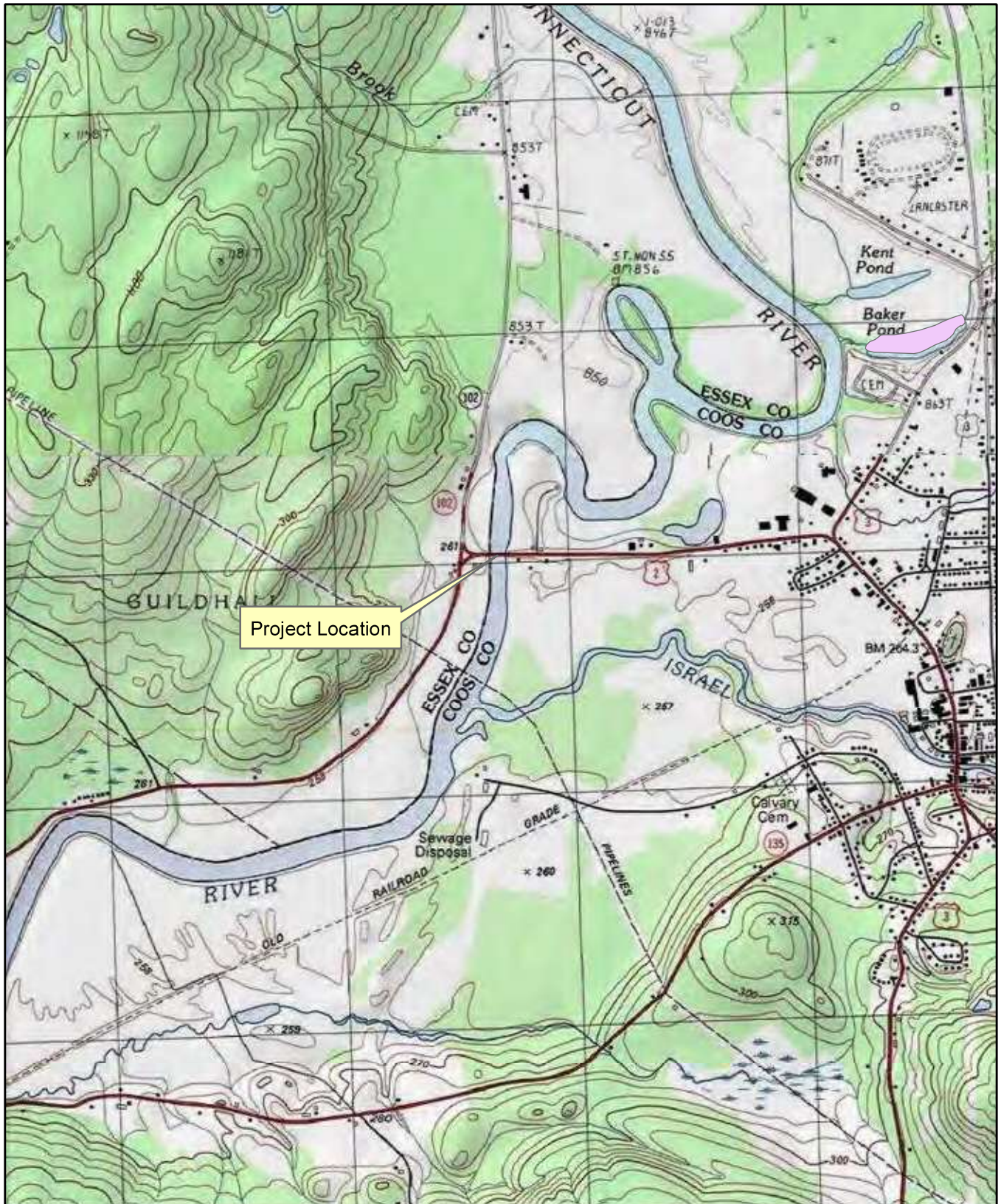
Total = \$

The Application Fee is the above calculated Total or \$200, whichever is greater = \$ 8,014.20

lrn@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov



0 1,000 2,000 4,000 Feet



NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
LANCASTER NH & GUILDHALL, VT
LANCASTER-GUILDHALL 16155

EXHIBIT A - LOCATION

SCALE: 1:24,000

NORMANDEAU
environmental consultants
25 Nashua Road Bedford, NH 03110
(603) 472-5191 www.normandeau.com

JANUARY 2018

Date : 1/11/2018
Drawn By: volase
Project No: 22286.010

Attachment A

Env-Wt 302.04 Requirements for Application Evaluation - For any major or minor project, the applicant shall demonstrate by plan and example that the following factors have been considered in the project's design in assessing the impact of the proposed project to areas and environments under the department's jurisdiction.
Respond with statements demonstrating:

1. The need for the proposed impact.

The NH Department of Transportation (NHDOT) proposes to replace bridge 111/129, carrying US Route 2 over the Connecticut River in Lancaster, New Hampshire and Guildhall, VT (Exhibit A - Location Map). The replacement structure will accommodate two 12-foot lanes of traffic (one in each direction) with two five-foot shoulders and one ten-foot snowmobile path.

Purpose

The purpose of the project is to provide safe, sustainable, efficient and cost-effective multimodal movement of people and goods across the Connecticut River while supporting the existing and future transportation, commerce, economic development and regional emergency response needs for the communities of Lancaster, NH and Guildhall, VT.

Need

There is a need to:

- Address the deteriorating condition of the existing bridge.
- Provide a low maintenance bridge that meets NHDOT geometric and capacity requirements while minimizing cost and construction duration.
- Provide a safe and sustainable crossing that can carry current statutory vehicular loads.
- Minimize natural and cultural resource impacts.

The need for the project is evidenced by the following:

- The existing bridge is in poor condition due to truss and floor system member advanced deterioration and section loss.
- The existing substructure is in poor condition.
- The existing bridge has 14'-0" measured vertical clearance, which is substandard.
 - Minimum required vertical clearance is 16'-6"
 - Truss vertical, sway bracing and portal members have significant impact damage and are impacted frequently.
 - Public safety is compromised when logs are dislodged from trucks during impact.

- The bridge has an “E-1” load posting which prohibits crossing by a single unit certified vehicle.
- US Route 2 is a significant trucking corridor heavily used by the timber harvesting industry.
- Lancaster and Guildhall depend on a crossing at this location across the Connecticut River for a school bus route and for access for mutual aid and emergency services.
- Snowmobiles that currently use the cantilevered snowmobile path to cross the river cannot safely pass side by side.

Existing Bridge

The subject bridge was built in 1950 and is comprised of two High Parker Through Steel Trusses with an overall length of 398 feet. The roadway is approximately 28 feet wide, providing two 12-foot travel lanes and two 2-foot shoulders. The section width is consistent as it passes over the bridge. Additionally, the bridge has a cantilevered snowmobile path which was added to the bridge in 1996. The bridge is on NHDOT’s Red List of structurally deficient bridges due to advanced deterioration and section loss to the truss and floor system members, poor substructure condition, substandard vertical clearance, damage from impact, and compromised public safety.

Proposed Design

The proposed bridge replacement will involve relocating the bridge upstream of its current location. The replacement is proposed to be 400 feet long. The replacement superstructure will have an overall width of 47’0” to accommodate two 12’0” travel lanes and two 5’0” shoulders. Additionally, the proposed plans will include one 10’0” snowmobile path to accommodate snowmobiles.

The proposed bridge will consist of two spans, each with lengths of 200’ that consist of structural steel welded plate girders. This layout was chosen because it minimizes substructure costs and environmental impacts with the construction of a single pier.

The proposed bridge pier is a wall type pier and will be supported on a reinforced concrete spread footing founded on a foundation seal with 6-foot diameter reinforced concrete drilled shafts. Drilled shafts are constructed using permanent cylindrical steel casing or caissons which are socketed into the bedrock substrate in the river. The steel casing or caissons are filled with concrete placed via a “tremie”, which is a pipe submerged in the water with the end under the surface of the concrete. The water is displaced as the concrete is pumped into the casing or caissons and the displaced water can be pumped offsite to an upland area and treated for disposal. The pier construction will occur within a cofferdam to protect water quality in the river.

2. That the alternative proposed by the applicant is the one with the least impact to wetlands or surface waters on site.

Several Alternatives were considered during the design process to meet the purpose and need.

Alternative 1 - No Build

The no-build alternative would have no immediate impact to wetland resources. However, taking no action would lead to the continued deterioration of Bridge 111/129 leading to the closure of the bridge. This alternative would not fulfill the purpose and need of the project.

Alternative 2 - Bridge Rehabilitation

Re-use of the existing structure was investigated. Rehabilitation of the existing structure would require replacement of the bridge pier and wetland impacts would be comparable to those proposed for the preferred alternative. It was determined that bridge rehabilitation would not meet the purpose and need because it would not satisfy the structural requirements, and it was removed from consideration.

Alternative 3 - Bridge Bypass

This alternative would consist of bypassing the existing bridge by installing a new vehicular bridge and retaining the existing bridge for multimodal use. While similar to the Proposed Action detailed above, by not removing the existing bridge, this alternative would include the rehabilitation of the existing bridge. This would be the most costly alternative and because the existing pier would not be removed, there would be no restoration of the bottom habitat that would occur with the proposed action.

3. The type and classification of the wetlands involved.

Wetlands proposed to be impacted include Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded (R2UBH); Palustrine, Emergent, Persistent Vegetation, Seasonally Flooded / Saturated (PEM1E); and jurisdictional riverbank.

4. The relationship of the proposed wetlands to be impacted relative to nearby wetlands and surface waters.

The Connecticut River and a small area of wet meadow north of US Route 2 are proposed to be impacted. There are no other wetlands in the vicinity of the project.

5. The rarity of the wetland, surface water, sand dunes, or tidal buffer zone area.

As the largest river in New Hampshire, the Connecticut River is unique. The river provides habitat for federally endangered dwarf wedgemussels, whose habitat in northern New England is limited to the Connecticut River and its tributaries. Palustrine emergent wetlands (PEM) of the type proposed to be impacted are not rare in New Hampshire.

6. The surface area of the wetlands that will be impacted.

The project will involve a total of 37,806 square feet of temporary impact (including to the emergent wetland) and (net) 1,485 square feet of permanent impact to riverbed and riverbank. Impact Areas depicted on Wetland Impact Plans will include the following types of impact:

Impact Area A (35,772 sq. ft. Temporary)

- Installation of driven (H or pipe) piles for support of temporary trestles required for the construction of the proposed bridge and removal of the existing bridge
- Installation of steel-sheeted cofferdam
- Installation of temporary shoring towers, within the river, to support the existing bridge during removal operations
- Installation of water diversion structures for removal of the exiting pier
- Demolition and removal of the existing pier debris
- Removal of temporary trestles

Impact Area B (1,056 sq. ft., 66 li. ft. Permanent)

- Concrete seal excavation (permanent impact, within the steel-sheeted cofferdam area within Impact Area A)
- Drilled shaft construction (permanent impact, within the steel-sheeted cofferdam area within Impact Area A)

Impact Area C (-390 sq. ft., -55 li. ft. Permanent)

- Removal of the existing pier to the mudline and natural restoration of river bottom to natural substrate

Impact Area D (1,943 sq. ft. Temporary)

- Grading and removal of vegetation to provide access for bridge construction.

Impact Area E (91 sq. ft. Temporary)

- Temporary impact to an emergent wetland at a pipe outlet, associated with the replacement of a cross culvert, north of U.S. Route 2.

Impact Area F (527 sq. ft., 47 li. ft. Permanent)

- Reconstruction of an existing drainage swale and installation of drainage stone to prevent further erosion.

Impact Area G (292 sq. ft., 26 li. ft. Permanent)

- Installation of scour stone to accommodate flows and prevent erosion from the drainage swale into the Connecticut River.

7. The impact on plants, fish and wildlife including, but not limited to:

- a. Rare, special concern species;
- b. State and federally listed threatened and endangered species;
- c. Species at the extremities of their ranges;
- d. Migratory fish and wildlife;
- e. Exemplary natural communities identified by the DRED-NHB; and
- f. Vernal pools.

Response to 7.a., 7.b., 7.c.:

The New Hampshire Natural Heritage Bureau (NHNHB) tracks rare plants and exemplary natural communities in New Hampshire. Under the Native Plant Protection Act of 1987 (RSA 217-A) plants that are recognized as “threatened” or “endangered” are protected. “Special Concern” species are not protected under RSA 217-A and NHNHB does not track locational data for these species. Some species that are rare in New Hampshire may be globally common but are rare because they are at the extremity of their range in the state.

New Hampshire-Listed Species

A datacheck with the NHNHB dated May 24, 2018 identified the state and federally endangered dwarf wedgemussel and the Special Concern Species riverine clubtail (*Stylurus amnicola*) as occurring near the project area (Exhibit E – NHB18-1603). The New Hampshire Fish and Game (NHF&G) non-game program was contacted for guidance on the rare animal species occurrences. NHF&G had no concerns about the riverine clubtail, and is aware that Section 7 Consultation for dwarf wedgemussels has been undertaken with the US Fish and Wildlife Service New England Field Office (USFWS) (Exhibit F – NHF&G Correspondence).

Federally-Listed Species

An inquiry was made through the USFWS Information for Planning and Conservation website (IPaC) that indicated that the northern long-eared bat (*Myotis septentrionalis*), the dwarf wedgemussel and Canada lynx (*Lynx canadensis*) have the potential to occur within the project area (Exhibit G – IPaC Consultation Response). Section 7 consultation with the USFWS New England Field Office was undertaken and a Biological Opinion (BO) was issued by the USFWS on March 31, 2017 (Exhibit I – Section 7 Biological Opinion). The BO included a determination that incidental take of the dwarf wedgemussels is likely to occur and included a number of reasonable and prudent measures and terms and conditions that must be followed. These include:

- A pre-construction mussel survey and relocation in August or September the year before construction starts.
- A prohibition on in-water work from April 1 to May 15, when spring spawning of dwarf wedgemussels is likely to be at its peak.
- Best Management Practices for construction to avoid, minimize and mitigate impacts to dwarf wedgemussels.
- A requirement that if more than 25 mussels are found during the first preconstruction survey, a second survey and relocation must occur before the second year of construction.
- Requirements for monitoring and reporting following the mussel relocation operation.

The BO also included determinations that Canada Lynx and Northern Long-Eared Bats would not be affected by the proposed project.

Response to 7.d. Migratory fish and wildlife

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act manages the conservation of marine fish species and their habitat, including anadromous species. Essential Fish Habitat (EFH), identified and mapped by the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) means “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity”. The entire Connecticut River is identified as Essential Fish Habitat for Atlantic salmon (*Salmo salar*). However, the NMFS recently determined that EFH consultations for Atlantic Salmon are no longer required in the Connecticut River, as the species is no longer present (Exhibit H – EFH Correspondence). The NMFS maintains that permanent impacts to diadromous fish habitat should be avoided and minimized. Wetland impacts have been avoided and minimized to the extent possible and all appropriate erosion and sedimentation control measures will be followed during construction.

Response to 7.e. Exemplary Natural Communities

No Exemplary Natural Communities were noted as occurring near the project area.

Response to 7.f Vernal pools

There are no vernal pools in the vicinity of the project.

8. The impact of the proposed project on public commerce, navigation and recreation.

The project will have positive effects to public commerce, navigation and recreation by improving the safety for travelers crossing over the bridge and for boat traffic under the bridge. The existing bridge will remain open throughout construction.

9. The extent to which a project interferes with the aesthetic interests of the general public. For example, where an applicant proposes the construction of a retaining wall on the bank of a lake, the applicant shall be required to indicate the type of material to be used and the effect of the construction of the wall on the view of other users of the lake.

The project will remove a rusting and damaged red-listed structure, and the new bridge will not interfere with the aesthetic view of the river and adjacent hayfields.

10. The extent to which a project interferes with or obstructs public rights of passage or access. For example, where the applicant proposes to construct a dock in a narrow

channel, the applicant shall be required to document the extent to which the dock would block or interfere with the passage through this area.
<p>The project will not interfere with public rights of passage or access. Traffic will be maintained over the existing bridge until the new bridge is completed. The new bridge will not impede boat traffic on the river. Provisions to provide boat access through the construction zone will be in place, though there will be temporary restrictions to boat traffic during certain construction activities such erection of steel and work over the channel where public safety is a concern.</p>
11. The impact upon abutting owners pursuant to RSA 482-A:11, II. For example, if an applicant is proposing to rip-rap a stream, the applicant shall be required to document the effect of such work on upstream and downstream abutting properties.
<p>The long term impact to abutting property owners will be positive as the new bridge will provide a safer crossing and collisions into the overhead truss members of the existing bridge by logging trucks will no longer occur.</p> <p>Additional Right-of-Way (ROW) will need to be acquired to implement the Proposed Action: approximately 1.50 acres of permanent ROW acquisition and 0.43 acre of temporary ROW easement in NH. Such acquisition will not impair the function of the affected properties. No private homes, businesses or rental units will need to be displaced. Relocation services will not be warranted. A small barn in Lancaster, located 386 feet east of the bridge on the north side of US Route 2 and 21 feet from the edge of pavement, will be removed to accommodate the new roadway alignment. All property owners from which land acquisition or easement will occur will be adequately compensated in accordance with the Federal Uniform Relocation and Assistance and Real Property Acquisition Policies Act of 1970, as amended.</p>
12. The benefit of a project to the health, safety, and well being of the general public.
<p>The project will improve health, safety, and well-being of the general public by providing a safe structure for vehicular traffic. Under the existing condition, there is anecdotal evidence of public safety being compromised when logs are dislodged from logging trucks during impact, which happens regularly.</p> <p>A second safety concern on the Vermont side will be improved by reconfiguring the intersection of US Route 2 and VT Route 102.</p>
13. The impact of a proposed project on quantity or quality of surface and ground water. For example, where an applicant proposes to fill wetlands the applicant shall be required to document the impact of the proposed fill on the amount of drainage entering the site

versus the amount of drainage exiting the site and the difference in the quality of water entering and exiting the site.

There will be no impact to the quantity of surface and ground water. A hydraulic study was undertaken that demonstrates that the bridge will pass the same volume of water as it does currently. Groundwater will not be affected by this project.

The US Route 2 Bridge Replacement project is within the Connecticut River Designated Corridor and will have greater than 50,000 square feet of disturbance. Therefore, the project is required to meet the New Hampshire Department of Environmental Services (NHDES) Alteration of Terrain (AOT) Rules under the Memorandum of Agreement (AOT MOA) between the New Hampshire Department of Transportation and NHDES. This project will increase the impervious surface area by approximately 6,100 square feet due to increased roadway and bridge shoulder widths and realignment of the VT Route 102 and US Route 2 intersection. In accordance with the AOT MOA, this project will need to capture and treat a minimum of two times the increased impervious surface area, or at least 12,200 square feet. Several options have been considered for stormwater treatment, with treatment swales being the recommended method of treatment. A 162' long, 4' wide swale is proposed within the existing Vermont bridge approach fill material. A 216' long, 4' wide swale is proposed within the existing New Hampshire bridge approach fill material. These lengths and widths were required to achieve hydraulic residence times that would meet NHDES AOT regulations. Deep sump catch basins are proposed to provide pretreatment for the swales.

14. The potential of a proposed project to cause or increase flooding, erosion, or sedimentation.

The project will not cause flooding, erosion, or sedimentation. All appropriate erosion and sedimentation controls will be used during construction to prevent sedimentation or turbidity in the Connecticut River.

The proposed project is in a special flood hazard area (Zone A6) and is being constructed within a regulatory floodplain based on a review of the National Flood Insurance Program FIRM maps. The proposed new pier will be constructed within the regulatory floodway of the Connecticut River and the existing pier will be removed. (Exhibit D-1, FEMA Floodplain) A hydraulic study was undertaken for the project that demonstrated that there would be no increase in base flood elevations for the 100-year flood (Q-100 flood) with the construction of the proposed bridge. The hydraulic study shows a slight decrease in base flood elevations of between 0.1 feet and 0.5 feet, at the proposed bridge crossing and to approximately 350 feet upstream and 50 feet downstream of the bridge, as a result of improved hydraulic opening geometry and characteristics associated with the proposed construction (Exhibit D-2 - Hydraulic Analysis Letter Report).

15. The extent to which a project that is located in surface waters reflects or redirects current or wave energy which might cause damage or hazards.
The project will redirect currents around the existing pier during demolition, and around the new pier locations during construction. The redirection of water during construction is not anticipated to cause damage or hazards.
16. The cumulative impact that would result if all parties owning or abutting a portion of the affected wetland or wetland complex were also permitted alterations to the wetland proportional to the extent of their property rights. For example, an applicant who owns only a portion of a wetland shall document the applicant's percentage of ownership of that wetland and the percentage of that ownership that would be impacted.
Due to the nature of the project it is unlikely that abutters would seek to impact the Connecticut River to the same extent. However if they were to do so there would be incremental impacts to the river that would affect the functions and values provided by the river, including habitat for dwarf wedgemussels.
17. The impact of the proposed project on the values and functions of the total wetland or wetland complex.
The primary function of the aquatic resource that will be affected by the project is habitat for federally endangered dwarf wedgemussels. NHDOT has completed Section 7 consultation with the USFWS which has concluded that with measures to avoid and minimize adverse effects, the project will not jeopardize the continued existence of the dwarf wedgemussel. The effects to the Connecticut River as a whole will not be significant given the size of the resource.
18. The impact upon the value of the sites included in the latest published edition of the National Register of Natural Landmarks, or sites eligible for such publication.
Not applicable.
19. The impact upon the value of areas named in acts of congress or presidential proclamations as national rivers, national wilderness areas, national lakeshores, and such areas as may be established under federal, state, or municipal laws for similar and related purposes such as estuarine and marine sanctuaries.
The portion of the river that flows through the project area is designated under RSA 483, the New Hampshire Rivers Management and Protection Program, as a "Rural" river. In accordance with RSA 483, a copy of this wetland application is being sent to the Riverbend subcommittee of the Connecticut River Joint Commissions for their review.
20. The degree to which a project redirects water from one watershed to another.
Not applicable.
Additional Comments
None

Mitigation

The proposed project requires compensatory mitigation for the proposed permanent impacts in accordance with 302.03(b). Mitigation was discussed at a meeting with NHDES on February 21, 2018 and it was agreed that the following mitigation would be appropriate for this project:

Streambed Restoration

The new pier will incur 66 linear feet of impact to the channel of the Connecticut River. The existing pier that is proposed to be removed will provide 55 linear feet streambed restoration (bridge pier removal). Table 800-1: Minimum Compensatory Mitigation ratios in NHDES Wetland Rules Env-Wt allow that for restoration of riverbed impacts (under "all Other Jurisdictional Areas" the required restoration ration is 1:1. As such, 11 linear feet of streambed impact must be mitigated.

In addition to the pier impacts there are also 47 linear feet of bank impacts and 26 linear feet of channel impacts proposed for the regrading and stabilization of the existing drainage swale under the bridge. An ARM fund payment of \$20,805.12 for the 26 + 11 linear feet of streambed impact and 47 linear feet riverbank is proposed to compensate for these impacts. NHDOT also proposes to restore the riverbank that will be temporarily disturbed with native plantings.

Table 1 ARM Fund Payment Calculation

NHDES AQUATIC RESOURCE MITIGATION FUND STREAM PAYMENT CALCULATION		
INSERT LINEAR FEET OF IMPACT on BOTH BANKS AND CHANNEL	Right Bank	47.00
	Left Bank	
	Channel	37.0000
	TOTAL IMPACT	84.0000
	Stream Impact Cost:	\$17,337.60
	NHDES Administrative cost:	
		\$3,467.52
***** TOTAL ARM FUND STREAM PAYMENT*****		
\$20,805.12		

BUREAU OF ENVIRONMENT CONFERENCE REPORT

EXHIBIT B

SUBJECT: NHDOT Monthly Natural Resource Agency Coordination Meeting

DATE OF CONFERENCE: October 17, 2012

LOCATION OF CONFERENCE: John O. Morton Building

ATTENDED BY:

NHDOT

Christine Perron

Marc Laurin

Kevin Nyhan

Alex Vogt

Mike Hazlett

David Gaylord

Dave Rodrigue

Rich Radwanski

Kirk Mudgett

Lucas Siik

Dean Eastman

Mike Dugas

Steve Liakos

Joe Adams

Nickie Hunter

**Federal Highway
Administration**

Jamie Sikora

NHDES

Gino Infascelli

Army Corps of Engineers

Rich Roach

NH Fish & Game

Carol Henderson

Hoyle, Tanner & Associates

Sean James

Louis Berger Group

Tom Levins

Normandeau

Lee Carbonneau

Archer Western

Stephen DelGrosso

(When viewing these minutes online, click on an attendee to send an e-mail)

PRESENTATIONS/ PROJECTS REVIEWED THIS MONTH:

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Salem, 20225, non-federal	5
Lancaster-Guildhall, 16155, A001(159)	6
Salem-Manchester, 10418H, A000(712) – Late addition to agenda	7

(When viewing these minutes online, click on a project to zoom to the minutes for that project)

Rich Roach asked if the bridge was designed to pass the 100-year storm. T. Levins explained that the bridge was designed to pass the 50-year storm with 1 foot of freeboard according to NHDOT guidelines, but the bridge also passes the 100-year storm.

Carol Henderson asked what the height of the existing structure was. T. Levins stated that it is about 6 feet. The new opening is approximately 7.15 feet high.

C. Henderson asked for further explanation of the proposed streambed construction through the bridge. T. Levins explained that bridge stone fill was required for scour protection for the foundations. The stone fill is approximately 2 feet thick. The top foot of stone fill will be mixed with streambed material that will be excavated to construct the foundations, replicating the streambed characteristics upstream and downstream. This procedure was used on the South Policy Street project in Salem in 2011 and seems to be working well.

R. Roach was interested in seeing a photo of the South Policy Street bridge showing the conditions. T. Levins explained that the streambed material is very dark upstream and downstream and the water is murky, resulting in poor visibility to the channel bottom. The assumption is that the natural stream bottom is still in place through the structure.

Gino Infascelli asked if a dry shelf could be constructed through the bridge for critters that do not swim. T. Levins stated that the structure would need to be larger to maintain the required hydraulic opening if the dry shelves were constructed. LBG did do an analysis to determine what size structure would be needed to meet the new Stream Crossing Rules and create dry shelves that would be outside the normal flow limits. The result was a hydraulic opening 349% larger than the existing bridge and 211% larger than the proposed bridge. This is not practical considering the proposed alternative passes the Q100 storm and limited Town funds would not warrant the additional cost. Experience has shown that dry shelves constructed in small bridges do not survive the first heavy storm.

This project has not been previously discussed at a Monthly Natural Resource Agency Coordination Meeting.

Lancaster-Guildhall, 16155, A001(159)

Sean James of Hoyle Tanner & Associates, Inc. presented the project. The Roger's Rangers Bridge spans the Connecticut River between Lancaster, New Hampshire and Guildhall, Vermont. It is a two-span, steel truss bridge constructed in 1950. There are issues with rust, vertical clearance, and the condition of the abutments and piers. Two options are currently being considered: 1) rehabilitation of the existing bridge, which would include the construction of a temporary bridge to the north (upstream); and 2) replacement of the bridge with a permanent new structure to the north (upstream). The project was presented at the Cultural Resource meeting last week, and has a Public Informational meeting scheduled for November 8th in Lancaster. A public meeting will also be scheduled for Guildhall, VT. The project is in its early stages.

Lee Carbonneau of Normandeau Associates, Inc. described the natural resource surveys and findings to date. Wetlands were delineated in the summer of 2012. There is one wetland approximately 50 feet off Route 2 in Lancaster in a farm field. There are several wetlands in Vermont adjacent to Route 102/2. Those on the west side of the road may be contiguous to Class 2 wetlands and therefore "Significant" under VT wetland rules. A 50-ft buffer applies to Class 2 wetlands. Further coordination with the Vermont Agency of Natural Resources will be necessary.

The ordinary high water mark of the Connecticut River was also delineated, and is similar to the top of bank in most locations. The Connecticut River is 6th order, so the Shoreland Water Quality Protection Act applies. The river in this location is impaired for Aluminum and E-Coli. There is a boat access ramp on the

NH side of the river south of the bridge. The project is within the 100-year floodplain of the Connecticut River.

The NH Natural Heritage Bureau reports that the project area includes records for the federally endangered dwarf wedge mussel (*Alasmidonta heterodon*) and also the riverine clubtail (*Stylurus amnicola*), a NH state species of Special Concern. VT has mapped a rare species in the field west of Route 2, but the species is not yet known, and further coordination is required. The New Hampshire side of the river is mapped as Highest Ranked Habitat in NH in the Wildlife Action Plan.

There are no LWCF properties or conservation lands that would be affected by the project, and the dominant soils are excessively drained Sunday loamy fine sand, which is not listed as prime farmland. One underground storage tank is known to be east of the project area at Munces Convenience.

Richard Roach asked if the larval or adult stage of the clubtail is in the project area, and L. Carbonneau responded that both are in the project area, but that the larval phase is a benthic macroinvertebrate and could be the primary issue for in-channel work.

Carol Henderson pointed out that this reach of the Connecticut River is a hot spot for dwarf wedge mussel. She asked how far upstream a new bridge would be located, and whether the old bridge would be left in place. S. James responded that a new bridge would be located as close as possible to the existing bridge, and likely within 200 feet of it. There was a brief discussion regarding the practice of leaving old bridges in place next to new ones, but S. James indicated that this bridge would not likely be left if a new one is constructed. C. Henderson noted that the Connecticut River is a Designated River and the Local River Advisory committee should be contacted.

Jamie Sikora asked about the condition of the piers and abutments, and Sean noted that the abutments do require rehabilitation, and the piers may need work also.

Rich Roach asked to see the 100-year floodplain identified on the plans.

This project has not been previously discussed at a Monthly Natural Resource Agency Coordination Meeting.

Salem-Manchester, 10418H, A000(712) – Late addition to agenda

Marc Laurin presented a letter from the Windham Conservation Commission recommending that rather than the DOT providing an in-lieu fee contribution of \$288,500 to the ARM fund, this amount would be better suited for the Windham Conservation Commission's Land Fund in order to assist in the purchase and conservation of the Campbell Farm (a ±64 acre parcel) in Windham. Resource maps of the site were distributed. This parcel consists of open farm fields, forested uplands, over 5,100 feet of shoreline along Beaver Brook, as well as associated floodplain wetlands. The farm is historic, having been in existence since 1733, and has been identified in the Town's Open Space Plan as having the highest protection priority. The Town has \$500,000 slated to the purchase of this property, and with the additional mitigation monies the Commission feels that the property could be purchased.

Rich Roach and Carol Henderson thought that it may be an appropriate mitigation option as it would preserve a long area of shoreline along Beaver Brook, could have some water quality benefits by preventing development, and by preserving pervious lands, flood absorption and farmlands. They both deferred to DES on the appropriateness of the mitigation versus the DOT providing money to the ARM Fund. R. Roach thought that the property would meet the Corps Preservation mitigation ratios. Both C. Henderson and R. Roach stated that if this change were to be made, the NHDOT would need to hold an executory interest in the property, that access to the site by the general public would not be restricted, and that the

BUREAU OF ENVIRONMENT CONFERENCE REPORT

SUBJECT: NHDOT Monthly Natural Resource Agency Coordination Meeting

DATE OF CONFERENCE: October 16, 2013

LOCATION OF CONFERENCE: John O. Morton Building

ATTENDED BY:

NHDOT

Christine Perron
Ron Crickard
Matt Urban
Mark Hemmerlein
Jon Evans
Mike Dugas
Ron Grandmaison
Jon Hebert
Jason Tremblay
Michael Hazlett
Victoria Chase
Margarete Baldwin

Joe Patusky

**NH Natural Heritage
Bureau**

Melissa Coppola

NH Fish & Game

Carol Henderson

NHDES Wetlands Bureau

Gino Infascelli

Lori Sommer

Hoyle, Tanner & Associates

Sean James

Normandeau Associates

Jameson Paine

**Faye, Spofford &
Thorndike**

David McNamara

John Stockton

(When viewing these minutes online, click on an attendee to send an e-mail)

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Finalization of September Meeting Minutes	2
Dummer-Cambridge-Errol, X-A001(231), 16304.....	2
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Northfield-Tilton, X-A001(153), 16147 / Northfield-Tilton, X-A001(042), 14744A	5

(When viewing these minutes online, click on a project to zoom to the minutes for that project)

with the pier removal. He asked if the resource agencies still wished to proceed with the pier removal after consideration of the anticipated additional temporary construction impacts. Carol Henderson and L. Sommer both expressed a continued preference for removal of the existing center channel bridge pier, as it is unlikely that it would ever be removed once the Department completes its efforts in this area. It was noted that at previous meetings, the Army Corps and National Marine Fisheries Service had also expressed a preference for the removal of the existing center pier.

C. Henderson noted that, due to fish spawning activity, impacts to the river should be minimized during the fall and that the best time for work within the river would be during the summer, prior to early September. G. Infascelli suggested that, since the Mascoma River is dam controlled, the Department and/or the contractor may want to coordinate with Jim Gallagher from the DES Dam Bureau to coordinate the removal of the existing pier and construction of the new piers along the banks so that these efforts could be completed during periods of controlled low-flow.

This project was previously reviewed on the following dates: 3/21/2007, 11/19/2008.

Lancaster, NH-Guildhall, VT, A001(159), 16155

The purpose of this meeting was to update the group on the NHDOT'S US Route 2 Bridge Replacement Project. Sean James, of Hoyle, Tanner & Associates, Inc. (HTA), provided a brief introduction to the group. The original project scope of work was to rehabilitate the existing truss bridge (Bridge No. 111/129) that carries US Route 2 over the Connecticut River. However, since the project was last presented to the natural resource agency groups at the October 17, 2012 meeting, the project has been listed on the State's list of Red Listed bridges. Public meetings have been held where public input and concurrence has been received to replace the bridge with a new structure. The design team has developed basic roadway alignment alternatives, with a preferred alignment located to the upstream or north side of the existing bridge. Cultural resource reviews and coordination with SHPO representatives from both NH and VT have and will continue to occur.

Jameson Paine, of Normandeau Associates, Inc. (Normandeau), provided a brief overview of resource reviews that have been completed to date, as well as ongoing efforts, to assist in alternatives evaluations and to minimize impacts to resources in the area.

Normandeau staff has been on site to delineate wetlands, top of bank, ordinary high water, and invasive species locations. Small pocketed wetlands are located at the project extents, but don't appear to be within the immediate project alignment. The proposed bridge structure will require a center pier within the river. Permanent bridge abutment locations are currently expected to be beyond the delineated top of bank.

A review of the project site by the NH Natural Heritage Bureau indicates the potential presence of dwarf wedge mussels (DWM) within the Connecticut River. Coordination with Susi von Oettingen of the US Fish and Wildlife Service (USFWS) revealed that a large number of DWM was found a short distance downstream from the existing bridge location. Due to the amount of time until construction is expected to begin (Fall 2018), it is agreed that NHDOT would have a professional, licensed diver, who is experienced with mussel surveys, evaluate the presence of DWM and then coordinate with USFWS through a formal Section 7 consultation about a year prior to proposed construction.

Carol Henderson asked who owned a boat ramp located southeast of the existing bridge in NH. She also asked if utility lines would be attached to the new bridge. J. Paine responded that ownership of the boat ramp was uncertain and coordination is ongoing to determine final utility locations. Subsequent to the meeting, a review of the GRANIT online mapping tool and NH Fish & Game's boat access map indicate that the boat ramp is most likely a private boat ramp, with a facility name of Lancaster Kwik Stop.

Lori Sommer asked how the existing truss bridge would be removed. S. James indicated that removal methods still need to be discussed. As a historic structure, the bridge will be offered for sale. If an interested party comes forward to acquire the bridge, they will help direct the safe means for removal. J. Paine also noted that removal would need to take the potential presence of mussels into consideration.

This project was previously reviewed on the following date: 10/17/2012.

Northfield-Tilton, X-A001(153), 16147 / Northfield-Tilton, X-A001(042), 14744A

The purpose of this meeting was to provide an initial review for the rehabilitation of both Interstate 93 (I-93) bridge decks that carry the interstate over the Winnepesaukee River in Northfield and Tilton, NH. Dave McNamara, of Fay, Spofford and Thorndike (FST) provided an overview of the project's purpose and proposed improvements under the 16147 project. The NHDOT proposes to rehabilitate the two bridges carrying Interstate 93 (I-93) north (State Bridge No. 118/158) and southbound (State Bridge No. 117/157) over the Winnepesaukee River, in the Towns of Northfield and Tilton, NH.

The subject bridges are located a few hundred feet south of the Exit 20 ramps, with merging traffic occurring on the southbound bridge. The bridges were originally constructed in 1960, and then rehabilitated in 1980 and 1998. The existing bridges have four-span continuous curved steel girders, each with total length of approximately 330 feet. The southbound bridge carries three 12 foot lanes, with 46.5 feet roadway width, and 50' – 6" overall width. The northbound bridge carries two 12 foot lanes, with 38 ft – 6 in roadway width, and 42' – 6" overall width. The median is 75' – 6" wide. This project is on the NHDOT's Priority List and the bridges were placed on the State's Red List in 2009 for "Deck Poor" and "Scour Critical".

The existing horizontal alignments and vertical profiles will be maintained for the rehabilitated bridges. The southbound bridge is wide enough for three 12-foot travel lanes, but the current roadway configuration of two striped lanes will be retained, with the widened right lane serving as a continuation of the merge for the I-93 southbound on-ramp at Exit 20. This results in a 50' - 6" overall width that provides a roadway section equivalent to three 12 ft travel lanes, two 5'-9" shoulders, and two 1'-6" brush curbs. The 42'-6" overall width of the northbound bridge will continue to carry two 12 ft travel lanes, a 5'-9" inside shoulder, a 9'-9" outside shoulder, and two 1'-6" brush curbs in the current configuration.

As the poor condition of the concrete decks of both of the I-93 bridges result in a decreased load posting to the Operating Capacity for Certified Loads and inclusion on the Red List, bridge deck replacement is warranted for both bridges. The existing bridge decks, brush curbs, and expansion joints will be replaced. The existing steel bridge bearings will be evaluated during the final design phase of the project, but it is anticipated they will be replaced with elastomeric bearings. An investigation into the need for concrete shear keys or steel keeper angles will be conducted with the bearing evaluation. The existing steel beams and substructures will remain in place. All design will be in accordance with the AASHTO Load and Resistance Factor Design (LRFD) methodology and the NHDOT *Bridge Design Manual*.

The bridge deck will consist of a cast-in-place reinforced concrete slab that will be composite with the existing weathering steel beams throughout the entire length of the bridge. The 8-in bridge deck thickness of the 1980 reconstruction will be retained to avoid an increase over the current dead load. A cast-in-place deck will be used, and precast concrete deck panels will not be allowed due to the 7.7% superelevation. The existing bridge deck scuppers will remain in place or be replaced in-kind at their current locations, depending on their condition. The need to replace the light pole deck supports will be determined during the final design phase. Should the light poles be included in the rehabilitated structures, galvanized conduit will be placed in the brush curb, similar to the current condition.

BUREAU OF ENVIRONMENT CONFERENCE REPORT

SUBJECT: NHDOT Monthly Natural Resource Agency Coordination Meeting

DATE OF CONFERENCE: March 16, 2016

LOCATION OF CONFERENCE: John O. Morton Building

ATTENDED BY:

NHDOT

Matt Urban
Ron Crickard
Gary Clifford
Kerry Ryan
Roger Dionne
Mike Licciardi
David Scott
Rebecca Martin
Jason Abdulla
Stephanie Micucci
Ron Grandmaison
Jon Evans
Victoria Chase
Randy Talon
Shaun Flynn
Joe Adams
Marc Laurin
Mike Dugas

Jon Hebert
Meli Dube
Stephen Liakos
Sam Fifield
Don Lyford
Peter Salo
Tom Cleary
Mark Hemmerlien

Army Corps of Engineers

Michael Hicks

EPA

Mark Kern

FHWA

Leigh Levine

NHDES

Gino Infascelli
Ridgely Mauck

NH Fish & Game

Carol Henderson

NHB/DRED

Amy Lamb

Consultants/Public

Participants

Christine Perron
Vicki Chase
Nick Scegell
Bob Durfee
Ed Weingartner

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Bow, 24225	11
Walpole-Charlestown, 14747 & 14747A, X-004(487) & X-A000(149)	12

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further removing the pier to achieve an elevation several feet below the new riverbed elevation was appropriate.

R. Talon also noted that this section of river is a Class A drinking water supply for the City of Lebanon and that one of the City's water intakes is located just downstream from the project location. He noted that so far throughout the construction of this project the City of Lebanon's water department has not had any issues with the project and that the Department really does not want to jeopardize the good rapport that has been developed with the City water department.

Since NHF&G had been one of the agencies that originally expressed a strong preference towards removing the pier, J. Evans asked Carol Henderson if she had any concerns with leaving the pier in its current condition, flush with the riverbed. C. Henderson indicated that she did not have a concern with this condition and agreed that the benefits of further pier removal were probably not worth the risks associated with the additional impacts.

Gino Infascelli indicated that the only concern he had was whether or not the pier presented a safety issue for kayaks and canoes. R. Talon indicated that since the pier is flush with the riverbed and smooth he did not feel that it presented a concern to recreational boats. G. Infascelli indicated that given R. Talon's assessment he did not have any concerns with leaving the pier in its current condition.

G. Infascelli indicated that in lieu of asking the Department to document this decision through a permit amendment or similar documentation, he would place a copy of the meeting minutes in the DES wetland's file to document the decision not to pursue further pier removal.

Lancaster – Guildhall, 16155, A001(159)

NHDOT proposes to replace the Rogers' Rangers Bridge (NHDOT Br. No. 111/129; CT. River Br. No. 26), which carries US Route 2 over the Connecticut River between the towns of Lancaster, NH and Guildhall, VT.

Vicki Chase introduced the project. The project is located in northern New Hampshire and is surrounded by farmland. The state line is on the Vermont side of the river but is at the low water line, so a portion of the river (during normal or high flows) lies within Vermont.

Ed Weingartner described the existing bridge – a two-span truss bridge, 398' long, built in the 1950's with a cantilevered sidewalk added in 1996 for pedestrian and snowmobile use. The bridge is on the red list due to its deteriorated condition. Rehabilitation and replacement alternatives were considered with replacement being the preferred alternative.

V. Chase reviewed natural resources at the site. The Connecticut River is a sixth order stream at this location and the replacement will require a major impact wetland permit. The watershed is 1,243 square miles extending north into Canada. There are federally endangered dwarf wedge mussels at the site and formal Section 7 consultation with USFW is underway. The area around the bridge has not been previously surveyed for dwarf wedge mussels, but the region is allegedly a hotspot for the species, so their presence is assumed.

The river is impaired by pH and aluminum (on previous 303(d) list it was impaired by pH and E. coli).

Riverine clubtail (*Stylurus amnicola*) was previously listed as a rare species at the site, but it no longer appears on the NHNH datacheck. A review of rare species GIS information on the Vermont side revealed a rare plant population along the edge of the river. *(Follow-up with Vermont Natural Heritage botanist Bob Popp indicated that the plant was Wright's spike-rush (Eleocharis diandra) which is a globally rare species of sedge that grows on exposed mudflats. It was collected over 50 years ago, and its exact location along the river is uncertain. Since no disturbance of the Vermont shoreline is proposed no survey was recommended.)*

NHDOT will coordinate as required under the agreement between USFW and FHWA for federally listed Northern Long Eared Bats.

E. Weingartner reviewed the proposed bridge details,

- Relocation approximately 70' North (Upstream)
 - Bridge Length = 400' Two 200' Long Spans
- Bridge Width = 47'
 - Two 12' Travel Lanes
 - Two 5' Shoulders
 - One 10' Sidewalk (Extra Width for Snowmobiles)
 - Single River Wall Pier
 - Founded on Drilled Shafts to Minimize Riverbed Impacts
 - Evaluating the use of a precast footing similar to Sarah Long Bridge replacement
- Full Height Concrete Abutments
 - Founded on Driven Piles

-

There will be no utilities carried under the bridge.

Construction access – HTA anticipates that access will be via a combination of stone causeways and trestles. The stone causeways would end at the existing abutments and there would be no stone within wetlands jurisdiction. HTA is currently analyzing eliminating impacts to the riverbed within Vermont for both construction and removal. There will be temporary towerings put in place on both sides to allow the truss to be taken out in sections, moved off onto land and dismantled. The existing pier would be removed to the mudline and the existing abutments would be removed to approximately three feet below ground.

New abutments will be essentially in line with the existing abutments (400' span replacing the existing 398' span). The proposed superstructure will not be any lower than the existing superstructure.

Impacts to the riverbed would include temporary impacts for the bridge removal and construction and permanent impacts for the construction of the new pier. With the removal of the existing pier there will be very little net fill in the river. A shoreland permit will also be required. The intent is to avoid Vermont permitting by staying out of the riverbed.

Outstanding issues include the Section 7 consultation which must be completed in order to complete NEPA. Section 106 has not yet been completed pending coordination with VTrans SHPO on an archaeological survey. There was also an architectural Section 106 survey undertaken

that determined that the bridge was eligible for the National Register of Historic Places. Mitigation measures for the bridge removal will be outlined in an MOA signed by FHWA, Vermont and NH SHPOs', and NHDOT.

Carol Henderson asked if the National Marine Fisheries Service had been consulted about Essential Fish Habitat for Atlantic Salmon. Consultation will take place as suggested.

Amy Lamb asked that if rare plant surveys were required by Vermont Natural Heritage that they also occur on the New Hampshire shoreline. (*As noted no surveys are required in Vermont.*) Correspondence with Vermont Natural Heritage will be forwarded to NHNHBB.

Gino Infascelli asked is there are any other proposed wetland impacts associated with the bridge replacement – there are not. There will be riprap proposed around the abutments which are outside of jurisdiction, above the top of bank. A question was asked about the surveyor's "water line" which will be removed from the wetland permit plans.

The existing pier area that will be removed (to the top of the footing) is 175 square feet. The proposed pier footprint will be 656 square feet. The pier will be built on drilled shafts and will not require scour protection. Matt Urban suggested a follow up meeting with G. Infascelli and Lori Sommer to confirm that no mitigation would be required.

G. Infascelli asked about stormwater treatment. E. Weingartner noted the existing drainage patterns will be maintained and the impervious area will be increased by approximately 11,700 sf due to the realignment of the approaches and wider pavement. An additional 23,400 sf of impervious area will be treated through treatment swales on both the Vermont and NH sides constructed above the 10-year floodplain and meeting minimum residence time requirements.

Derry, 24861, X-A002(975)

Mike Dugas and Jon Hebert gave an overview of the project, which will address safety concerns on NH Route 28 bypass at the intersection of Scobie Pond Road and English Range Road in Derry. The intersection will be signalized and NH Route 28 bypass widened to accommodate left turn lanes in both directions. There will be no widening on Scobie Pond Road and English Range Road except for the approaches immediately adjacent to the intersection.

The existing condition has site distance and high actual travel speed issues, which contribute to a high accident rate. The current drainage pattern includes swales on both sides of the roadway and closed drainage, however, the condition and efficiency of the existing pattern is questionable. Impervious surface will be increased by 16,000 square feet and will require permanent treatment to meet Alteration of Terrain rules. Treatment areas and options are unknown at this time and will be identified in conjunction with wetland delineations to be completed this spring. Right of way will need to be acquired for the widening and likely for placement of permanent stormwater treatment areas. A public information meeting will be held in April 2016, to be followed by a public hearing later this summer.

Meli Dube discussed the known natural resources and potential conflicts in the area. Wetlands are present and will be delineated Spring 2016. Wetland delineations will help locate potential stormwater treatment areas. The NH Natural Heritage Bureau has been consulted and confirmed that although there are records in the area, there are no concerns associated with the proposed work. An acoustic survey for the presence of northern long-eared bats was completed Summer

A question was asked on whether any microscale analysis (Air Quality) was being performed. Jennifer and Brian replied that yes, this study is part of the EA.

Amy Lamb: Asked on the vegetation type that would be impacted for stormwater treatment on NHTI properties. Brian stated the area was a mix of open lawn and forest with a sewer line running through this area of the property. Amy stated that impacts to forested areas within the floodplain should be minimized.

Lori Sommer: Lori inquires whether wetland mitigation options have been discussed with the two communities. Jennifer stated that a detailed discussion on this matter has not yet occurred.

Mark Kern: Mark inquired on the timing of the EA. Jennifer replied that it was expected to be completed in late spring.

Mark Kern: Mark asked if wetland impacts could be separated, wetlands, and tree clearing with 100' of streams. Jennifer agreed.

Matt Urban: Matt stated that the impact to Bow Brook would need to be mitigated.

Additional project information and preliminary design mapping is located on the project website www.i93bowconcord.com.

This project has been previously discussed at the 7/17/2002, 8/21/2002, 12/14/2005, 11/15/2006, 4/16/2014, and 8/16/2017 Monthly Natural Resource Agency Coordination Meetings.

Lancaster-Guildhall, #16155 (A001(159))

Vicki Chase reviewed the project. The project is the replacement of the US Route 2 bridge spanning the Connecticut River in Lancaster, NH and Guildhall, VT. The project area is located in a rural setting and is adjacent to hayfields, a private campground and a couple commercial businesses. The state line is on the Vermont side of the river, but is at the low water line, so a portion of the river (during normal or high flows) lies within Vermont.

Ed Weingartner described the proposed bridge replacement, 50 feet north (upstream) of the existing bridge, with two 200-foot long spans with a central pier built on four drilled shafts with a tremie seal and a footing on top of the tremie seal. Construction access has been defined for permitting purposes as a trestle or open structure from the New Hampshire side upstream of the proposed bridge and another temporary trestle downstream of the existing bridge to facilitate demolition. The construction access plan may be modified to address concerns of the NHDOT Construction Bureau. The current plan shows no impacts in Vermont, but there may be a need to install temporary shoring in Vermont to stabilize the existing bridge during demolition. Coordination with Vermont would proceed as needed if this alternative is pursued. Coordination with USFWS would also need to be undertaken to ensure that the Biological Opinion issued in March 2017 is still valid.

Wetland impacts are mostly temporary impacts associated with construction access necessary for construction on the new bridge and demolition of the existing bridge. Permanent impacts are associated with the proposed pier, which will be eleven feet longer than the existing pier. There are also permanent impacts associated with the proposed stone-lined drainage swale located south of the proposed bridge in an existing eroded drainage swale. The drainage swale will be re-graded and lined with stone to prevent further erosion. Vegetative stabilization was investigated and found to not be possible because of proposed flow velocity in the drainage swale. There is also a small area of temporary impact to a wetland on the north side of US Route 2 associated with the replacement of a cross culvert located about 1,000 feet west of the bridge crossing.

Mitigation is proposed as follows:

Permanent Impacts

- 92 linear feet of streambed impact
 - 66 linear feet of bridge pier construction
 - 26 linear feet of scour stone
- 47 linear feet of jurisdictional riverbank

Mitigation

- 55 linear feet of streambed restoration (bridge pier removal)
- Arm fund payment of \$20,805.12 for the remaining 37 linear feet (92 lf minus 55 lf) of streambed and 47 linear feet of riverbank impacts
- Riverbank restoration with native plantings

NHDES agreed that mitigation as presented would be appropriate for the project.

Outstanding issues:

- Permits – wetlands, shoreland
- Dwarf wedge mussel salvage plan – waiting on information from USFWS
- Dwarf wedge mussel salvage – summer 2018
- Schedule – ad date November 27, 2018

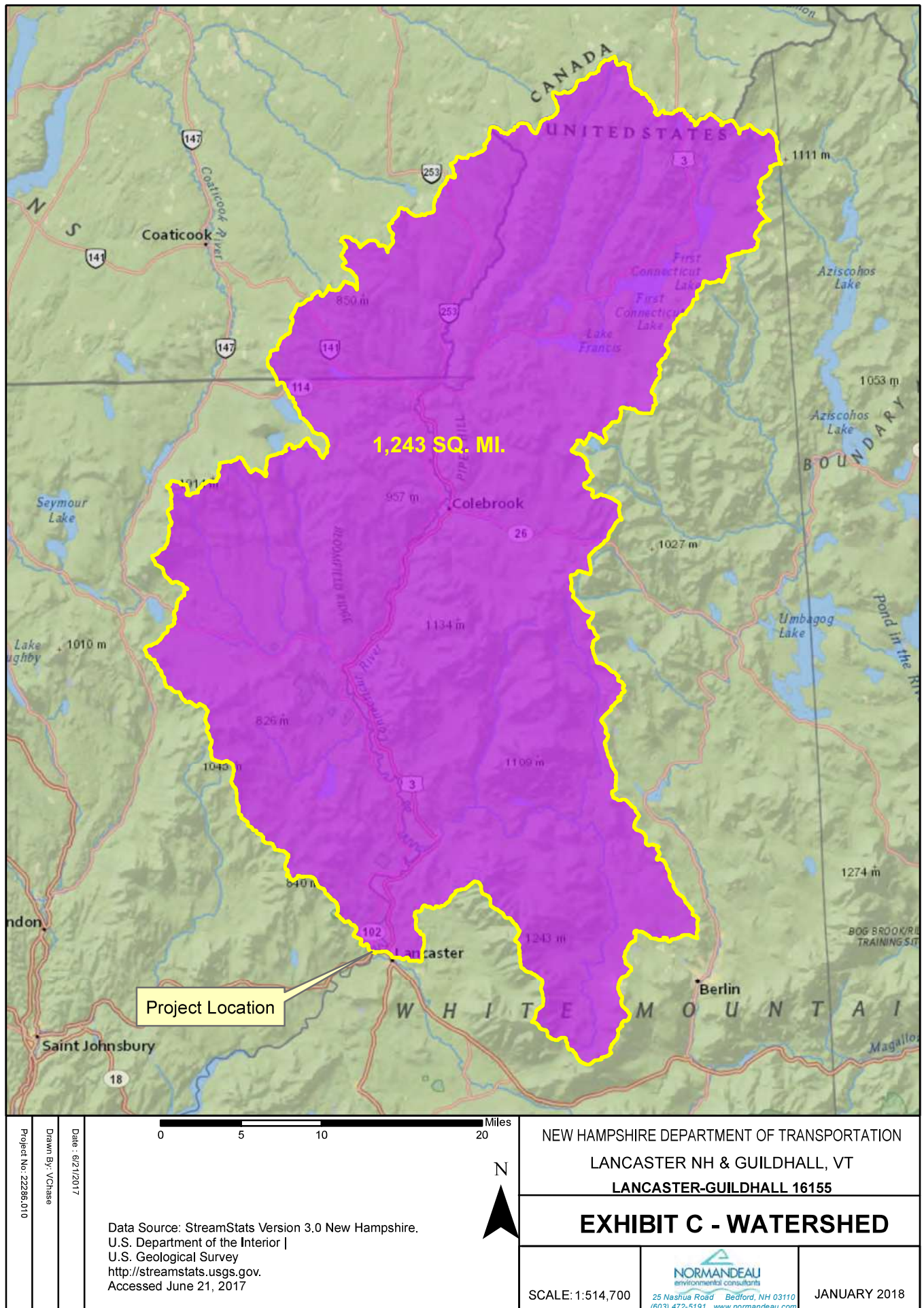
The river is impaired by pH and aluminum. Aluminum is a development impairment as recognized by NHDOT, so increases in impervious area have been addressed with regard to the proposed stormwater treatment measures.

The project has been cleared for impacts to Essential Fish Habitat. Atlantic Salmon are the only potential diadromous species that could be utilizing the Connecticut River, and as of June 28, 2017, the National Marine Fisheries Service no longer requires consultation for Atlantic Salmon in the Connecticut River in New Hampshire and Vermont because they are no longer present. Permanent impacts to diadromous fish habitat will be avoided to the extent possible.

This project has been previously discussed at the 10/17/2012, 10/16/2013, and 3/16/2016 Monthly Natural Resource Agency Coordination Meetings.

Gorham, #41396

Chris Fournier (HEB Engineers, Inc.) provided an overview of the project which involves the replacement of a culvert on Spring Road in Gorham, NH. A location map and existing-features



Env-Wt 900 Stream Crossing Requirements

The Connecticut River at the Rogers' Rangers Bridge has a watershed measuring 1,243 square miles and is a Tier 3 stream crossing. Env-Wt 904.05 addresses Design Criteria for Tier 2 and Tier 3 Stream Crossings, and Env. Wt 904.08 addresses requirements for the replacement of Tier 3 crossings.

Env-Wt 904.05 Design Criteria for Tier 2 and Tier 3 Stream Crossings.

Env-Wt 904.05 requires that new and replacement Tier 3 stream crossings shall be designed and constructed:

- (a) **In accordance with the NH Stream Crossing Guidelines, University of New Hampshire, May 2009.**

The New Hampshire Stream Crossing Guidelines (the Guidelines) provide recommendations for new and replacement stream crossings based in part on characteristics of the subject waterway. The Guidelines recommend submittal of the following information.

Description of the rationale for the stream crossing replacement.

The rationale for the stream crossing replacement is provided under the Purpose and Need section of this application.

Rosgen stream classification upstream and downstream of the existing stream crossing.

The Connecticut River at the existing stream crossing and upstream and downstream of the existing bridge is a Single-Thread Channel, Slightly Entrenched, with a Moderate to High Width to Depth Ratio, High Sinuosity, with a low slope. The river substrate is cobble / gravel / sand. Using the Rosgen Stream Classification Table it would fall under C3c – C5c.

Table 2. Rosgen Classification of the Connecticut River at the Rogers' Rangers Bridge

Rosgen Criteria	Measurement Method	Rosgen Criteria Value	Rosgen Category
Bankfull width	Width measured as an average of river widths upstream and downstream.	300'	
Bankfull elevation	Observed bankfull elevation matched to surveyed contours.	840'	
Maximum depth	Obtained from bathymetric survey.	825'	
Floodprone elevation	Bankfull depth (15') + bankfull elevation (840')	855'	
Floodprone width	Estimated using USGS Topographic map and Digital Elevation Models – Width of area where ground elevation is 855' or lower.	~3,000'	

Rosgen Criteria	Measurement Method	Rosgen Criteria Value	Rosgen Category
Entrenchment Ratio	Floodprone width/bankfull width = 3000/300	10	(SLIGHTLY ENTRENCHED)
Width / Depth Ratio			
	Bankfull / Maximum depth (bathymetric data) = 300/15	20	(MODERATE to HIGH)
Sinuosity			
	River Length/Valley Length measured north and south of the bridge = 13,163/9,344	1.4	(MODERATE to HIGH)
Slope			
	Calculated using FIRM base flood elevations and stream length for a 10 mile segment	0.0008	(Lowest range for single-thread channels)
Substrate			
	Visual assessment only	Cobble / gravel / sand	
STREAM TYPE			
	According to Rosgen Stream Classification Chart (Appendix B in the Guidelines)		C3c – C5c

Detrimental geomorphic consequences that have occurred as a result of the existing stream crossing, if they exist.

The Rogers' Rangers bridge is situated in an agricultural area that has likely been historically manipulated. The bank on the southeastern side of the bridge has been armored and construction of the boat ramp south of the bridge has involved cut and fill of the bank. Nevertheless this section of the river remains relatively intact and free-flowing.

Bed load sediment transport capacity of the channel upstream of the existing stream crossing.

Bedload capacity for the channel upstream and at the crossing are assumed to be comparable.

Demonstration that the stream crossing has accommodated the bankfull width, entrenchment ratio, bankfull width to bankfull depth ratio, and stream surface slope of the existing stream, within the natural ranges of variability for the stream type at the site of the stream crossing.

The Guidelines recommend a minimum crossing width of 1.2 times the bankfull width plus two feet on each side of the stream, which for the calculated bankfull width of 300 feet would be 364 feet. The proposed bridge will accommodate this requirement, as the proposed clear span will be 397 feet. The Guidelines also include a more detailed analysis

based on the Rosgen River Classification system. This more detailed analysis uses the bankfull width and width of the “flood-prone” area to calculate an “entrenchment ratio” for adequately sizing a crossing. The flood-prone area is calculated as the width at the elevation of twice the maximum depth at bankfull flow measured at a riffle or steep bed feature. At this location, using bathymetric data collected for the project, the maximum depth of the river is approximately 15 feet (bankfull= 840.00 – maximum depth = 825.00). The flood-prone area would therefore be measured as the area below Elevation 855.00. Contour data was collected within the project area but does not include the extent of the flood-prone area using this methodology. A review of USGS topographic data indicates that the flood-prone area would extend approximately 3,000 feet east of the bridge in Lancaster. Based on these dimensions, the entrenchment ratio, or the ratio of the width of the flood-prone area to the surface width of the bankfull channel in the location of the existing bridge is ten (10). Using the other parameters of Rosgen classification the river is classified as a “Type C” stream. The Rosgen classification is summarized in Table 1.

The Guidelines provide the following recommendations for Type C Stream Crossings.

“Type C channels have high entrenchment ratios and therefore commonly access well developed flood plains to accommodate high flow stages. Channels are typically sinuous with low slopes, less than 2%, and commonly consist of riffle/pool sequences. A concern in designing stream crossing structures for this stream type is channel stability and lateral extension. Channel stability and lateral movement is highly dependent on the adjacent stability of the natural stream bank. If existing bank stability is impacted, this channel type can quickly become unstable. To compensate for possible channel instability and wider bankfull flows, larger crossing structures and/or flood plain drainage structures should be considered.”

A crossing structure that spanned the entire flood-prone area would extend 3000'. The cost of a bridge of this length and scale would be orders of magnitude higher than the proposed alternative and was not considered. As noted previously, a hydraulic study was undertaken for this project that demonstrates that the proposed crossing will cause a slight decrease in base flood elevations, at the proposed bridge crossing and to approximately 350 feet upstream and 50 feet downstream of the bridge of between 0.1 feet and 0.5 feet, as a result of improved hydraulic opening geometry and characteristics associated with the proposed construction (Exhibit D - Hydraulic Analysis Letter Report). As such, no floodplain drainage structures are warranted, and the crossing as proposed conforms with the parameters identified above.

Pre- and post-stream crossing bed load sediment transport calculations are to be submitted for flows from incipient motion to twice the maximum bankfull depth.

Pre and post sediment transport are assumed to be comparable, therefore sediment transport calculations were not undertaken.

Plan view drawing of the crossing demonstrating the crossing site is appropriate

See Wetland Impact Plan Set.

Pre- and post-crossing water surface profiles for the bankfull flow event, the 10-year and 100-year flow events.

See Hydraulic Report, Exhibit D-2.

Narrative assessment of the long-term geomorphic consequences if the stream crossing is constructed.

Geomorphic consequences such as increased scour or erosion are not anticipated to occur. Long-term geomorphic consequences have been considered in design of the bridge and bridge pier.

Methods or structures to be implemented to minimize any consequences identified in the previous bullet.

Standard scour prevention will be installed at the bridge abutments outside of wetland jurisdiction. The bridge pier construction method will not require installation of scour stone and is designed in accordance with NHDOT standards.

The proposed crossing will avoid or mitigate the following problems as required by the Guidelines:

- Inlet drops
- Outlet drops
- Flow contraction that produces significant turbulence and increased velocities
- Tailwater armoring
- Tailwater scour pools
- Headwater pools
- Headwater flooding
- Physical barriers to aquatic organism passage
- Embankment failures/instabilities
- Channel entrenchment
- Channel sedimentation

(b) With the bed forms and streambed characteristics necessary to cause water depths and velocities within the crossing structure at a variety of flows to be comparable to those found in the natural channel upstream and downstream of the stream crossing;

The bed forms and stream velocities within the crossing structure will be comparable to those upstream and downstream of the crossing.

(c) To provide a vegetated bank on both sides of the watercourse to allow for wildlife passage;

The proposed bridge will provide a vegetated area on each side of the river to allow for wildlife passage. On the New Hampshire side the vegetated area will include a 3 to 4 foot

wide bank and 35 to 45 foot wide area of upland. The distance between the proposed abutment faces is 397 feet. Riprap will extend 16-21 feet in front of the abutment to protect against scour during high flow events.

- (d) To preserve the natural alignment and gradient of the stream channel, so as to accommodate natural flow regimes and the functioning of the natural floodplain;**

The natural alignment and gradient of the stream channel will be preserved.

- (e) To accommodate the 100-year frequency flood, to ensure that:**

(1) There is no increase in flood stages on abutting properties; and

(2) Flow and sediment transport characteristics will not be affected in a manner which could adversely affect channel stability;

A hydraulic study was undertaken for the project that demonstrated that there would be no increase in base flood elevations for the 100-year flood (Q-100 flood) for the proposed bridge. The hydraulic study shows a slight decrease in base flood elevations, at the proposed bridge crossing and to approximately 350 feet upstream and 50 feet downstream of the bridge of between 0.1 feet and 0.5 feet, as a result of improved hydraulic opening geometry and characteristics associated with the proposed construction (Exhibit D-1 - Hydraulic Analysis Letter Report).

- (f) To simulate a natural stream channel; and**

The crossing is and will continue to be a natural stream channel.

- (g) So as not to alter sediment transport competence.**

Sediment transport competence will not be affected by the proposed bridge replacement.

(3) The alternative design meets the general design criteria specified in Env-Wt 904.01.

The general design criteria specified in Env-Wt 904.01 will be met, as demonstrated below.

Env-Wt 904.01 General Design Considerations. All Stream crossings shall be designed and constructed so as to:

- (a) Not be a barrier to sediment transport;**

Sediment transport is and will continue to be accommodated at this crossing.

- (b) Prevent the restriction of high flows and maintain existing low flows;**

High and low flows are and will continue to be accommodated as demonstrated by the hydraulic study that was undertaken for the proposed bridge. (Exhibit D-1 - Hydraulic Analysis Letter Report).

(c) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;

Movement of aquatic life in the river will not be disrupted beyond the duration of construction.

(d) Not cause an increase in the frequency of flooding or overtopping of banks;

The hydraulic study undertaken for the project demonstrates that the base flood elevation will be slightly lower than for the existing condition, so no increase in the frequency of flooding will occur,

(e) Preserve watercourse connectivity where it currently exists;

Watercourse connectivity exists today and will continue to exist.

(f) Restore watercourse connectivity where:

(1) Connectivity previously was disrupted as a result of human activity(ies); and

(2) Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;

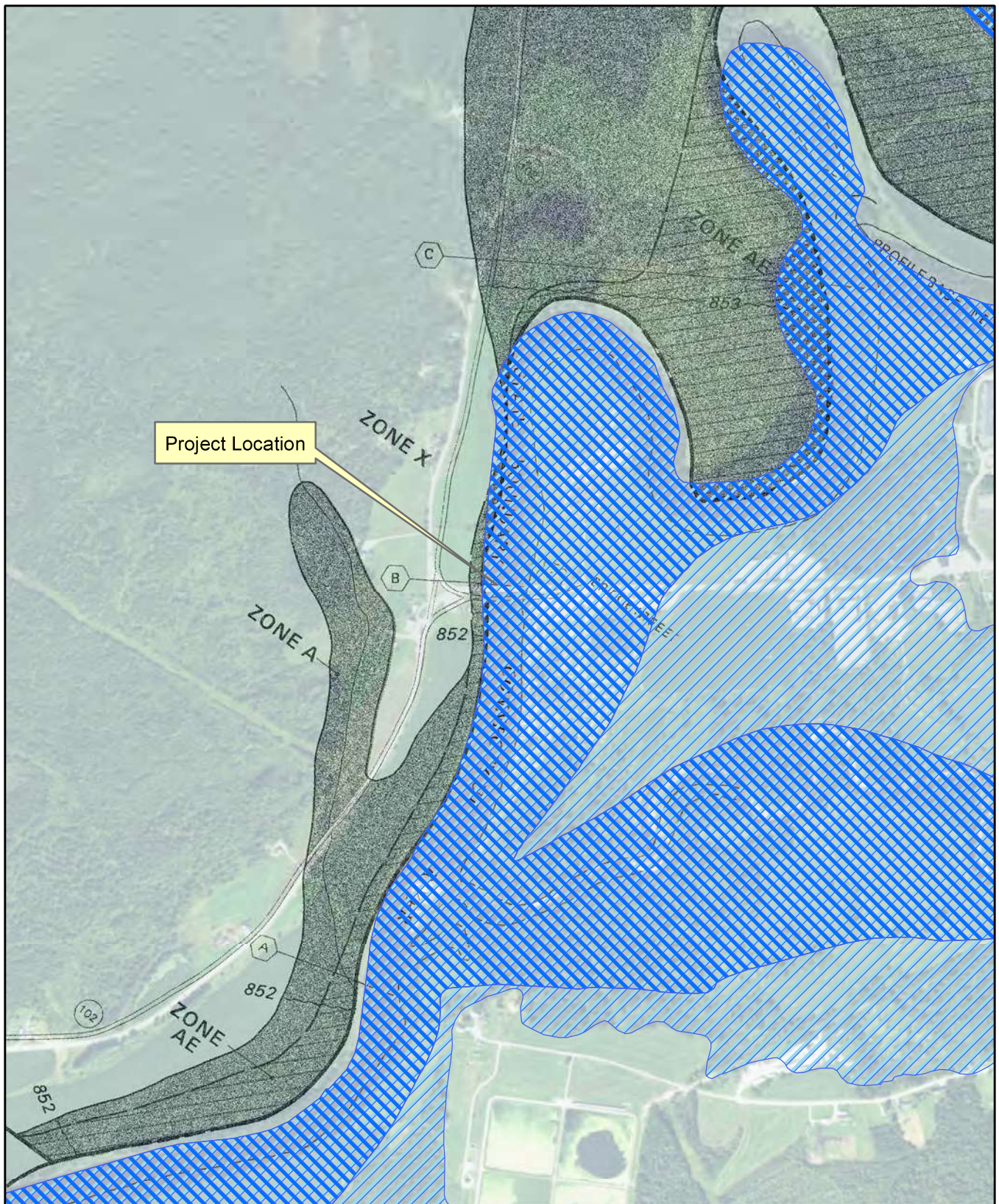
Not applicable to this project.

(g) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and

The proposed crossing is not expected to cause erosion, aggradation, or scouring upstream or downstream of the crossing. The proposed abutments lie outside of the riverbanks, and the proposed pier is of a comparable size and configuration as the existing pier.

(h) Not cause water quality degradation.

The proposed project will not cause water quality degradation. All appropriate erosion and sedimentation controls will be employed during construction to protect water quality in the Connecticut River.






Project No.: 22286.010	Drawn By: vchase	Date: 8/10/2017	<p>Legend</p> <p> 100-YEAR FLOODPLAIN WITH BASE FLOOD ELEVATION DETERMINED</p> <p> FLOODWAY</p> <p>Data Sources: VT - FEMA Panel 5000470020B (Location approximate) NH - DIGITAL FLOOD INSURANCE RATE MAP DATABASE, COOS COUNTY, NEW HAMPSHIRE, USA Panel 33007C0901D</p>	<p>NHDOT LANCASTER NH & GHILDHALL, VT LANCASTER-GUILDHALL 16155</p> <p>EXHIBIT D - FEMA FLOODPLAIN</p> <p>SCALE: 1:12,000</p> <p>  25 Nashua Road Bedford, NH 03110 (603) 472-5191 www.normandeau.com </p> <p>AUGUST 2017</p>		
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EXHIBIT E

August 14, 2017

Mr. Joseph C. Adams, P.E.
Chief of Consultant Design
Bureau of Bridge Design
New Hampshire Department of Transportation
7 Hazen Drive / P.O. Box 483
Concord, NH 03302-0483



Re: Lancaster, NH – Guildhall, VT A001(159), 16155
US Route 2 (Rogers' Rangers) Bridge over the Connecticut River
Existing Bridge No. 111/129
Replacement Bridge No. 112/130
Hydraulic Analysis Letter Report
Hoyle, Tanner Project No. 092558.01

Dear Mr. Adams:

Hoyle, Tanner and Associates, Inc. (Hoyle, Tanner) is pleased to submit this Hydraulic Analysis letter report which summarizes our analysis findings for the replacement of the US Route 2 (Rogers' Rangers) Bridge over the Connecticut River (Existing Bridge No. 111/129) in the towns of Lancaster, NH and Guildhall, VT. The purpose of this analysis was to demonstrate that the proposed bridge and approach roadway construction upstream of the existing bridge would not result in an increase in flood levels within the communities of Lancaster, NH and Guildhall, VT during the base flood discharge. The results of the HEC-RAS computer modeling and analysis performed for this project indicate there will be no increase in base flood elevation as a result of the proposed bridge replacement and approach roadway construction.

This letter report includes the following Appendices:

- Appendix A FEMA FIS Study Excerpts
- Appendix B FEMA FIS Backup Data
- Appendix C Analysis Notes and Assumptions
- Appendix D HEC-RAS Results and Comparison (Connecticut River Only)

Hydrology

FEMA Flood Insurance Studies (FIS) hydrologic flow data was used in the hydraulic modeling and is summarized in the table below. Refer to Appendix A for excerpts of hydrologic and hydraulic information taken from the FEMA FIS dated February 20, 2013.

Flooding Source and Location	Drainage Area (square miles)	100-year Peak Discharge (cfs)
Connecticut River at Dalton corporate limits	1,400	48,300
Connecticut River upstream of the confluence of the Israel River	1,250	44,300
Israel River at Confluence with the Connecticut River	135	22,970

Hydraulic Modeling

The FEMA FIS hydraulic modeling information was requested, obtained and reviewed by Hoyle, Tanner as part of this hydraulic analysis. This information served as the basis for developing the HEC-RAS, Version 5.0.3, computer models used for this analysis. Refer to Appendix B for FEMA FIS hydraulic modeling data. The following computer models were developed as part of this hydraulic analysis:

- Duplicate Effective
- Corrected Effective/Pre-Project Conditions
- Post-Project Conditions

This analysis was performed utilizing the NAVD88 datum to easily compare the HEC-RAS modeling output to the current FEMA FIS base flood elevations.

Duplicate Effective Model

The FEMA FIS hydraulic modeling was performed using the WSP2 computer software package. This software package utilizes a different set of equations and methodology for hydraulic computations as compared to the HEC-RAS software, including:

- Energy head loss in bridge/channel cross-sections
- Junction energy losses
- Bridge flow

Therefore, a Duplicate Effective model was first developed to compare and calibrate the HEC-RAS computer modeling and analysis results with the FEMA FIS results (developed with WSP2) to ensure the data was accurately interpreted and input into the HEC-RAS model. The water surface elevations computed for the Duplicate Effective model range from 0.0 to 0.7 feet lower than the FEMA FIS, dated February 20, 2013, base flood elevations. These computed water surface elevation differences indicate an acceptable correlation between the two modeling approaches. Refer to Appendix C for additional information regarding the differences between the WSP2 and HEC-RAS software packages and modeling approaches.

Corrected Effective/Pre-Project Conditions Model

The Corrected Effective/Pre-Project Conditions model refines the Duplicate Effective model by adding cross-sections and updating the original FEMA FIS cross-sections to more accurately reflect topography within the project surveyed limits. FEMA FIS model cross-sections located upstream and downstream, beyond the project survey limits, were not updated. LIDAR points were also utilized to supplement the floodplain topography/surface and further refine and accurately model the river topography and hydraulics. The Corrected Effective/Pre-Project Conditions model was further refined by adjusting Manning's n values, adding ineffective flow areas at the bridge cross-sections, and adjusting bridge cross-section expansion and contraction coefficients. These values were adjusted to reflect changes in land development or to correct the original input, as well as to incorporate areas where ineffective flow areas may occur. Refer to appendix C for additional information regarding adjusted values.

The water surface elevations computed for the Corrected Effective/Pre-Project Conditions model generally range from 0.0 to 0.2 feet lower than the water surface elevations computed for the Duplicate Effective model. The corrected model results indicate an increase in water surface

elevation ranging from 0.3 feet to 0.0 feet over a distance of approximately 4800 feet upstream of the inlet of the bridge; however, the water surface elevations computed for all cross sections of the corrected model are lower than the base flood elevations published in the FEMA FIS, dated February 20, 2013. These computed differences in water surface elevations at various cross sections indicate an acceptable correlation between the FEMA FIS published data and the Duplicate Effective and Corrected Effective/Pre-Project Conditions modeling approaches.

Post-Project Conditions Model

The Post-Project model was created to analyze the proposed project's impact to the Connecticut River hydraulics. This model, which was developed from the Corrected Effective/Pre-Project Conditions model, adds and modifies cross sections to reflect the proposed waterway opening and topography resulting from constructing the new bridge and roadway approaches upstream of the existing bridge, as well as the removal of the existing bridge.

The water surface elevations computed for the Post-Project Conditions model range from 0.0 to 0.5 feet lower than those computed for the Corrected Effective/Pre-Project model. The lower water surface elevations, which occur at the proposed bridge crossing and to approximately 350 feet and 50 feet downstream and upstream of the bridge, respectively, are a result of improved hydraulic opening geometry and characteristics associated with the proposed construction.

Bridge and Hydraulic Characteristics

Characteristic	Existing Bridge	Proposed Bridge
Clear Span (Abutment Face to Abutment Face) (FT)	400 +/-	397.0
Low chord Elevation (FT)	853.45	853.29
Inlet Flow Area (SF)	8282.53	8163.02
Inlet Waterway Opening (SF)	8490.45	8964.91
Inlet Pier Obstruction Area (SF)	207.92	648.11

Hydraulic Model Water Surface Elevation Results

The FEMA FIS, Duplicate Effective, Corrected Effective/Pre-Project Conditions and Post-Project Conditions water surface elevations are summarized in the table below. Refer to Appendix D for cross section locations and water surface profiles.

River Station	Profile	Model/Plan	Q Total (cfs)	HEC-RAS WS Elev (ft)	FIS WS Elev. (ft)
66188.61	Q100	Duplicate Effective	44300	852.1	852.5
66188.61	Q100	Pre-Project	44300	852.0	852.5
66188.61	Q100	Post Project	44300	852.0	852.5
60800.87	Q100	Pre-Project	44300	852.0	
60800.87	Q100	Post Project	44300	851.9	
60589.63	Q100	Duplicate Effective	44300	851.6	852
60589.63	Q100	Pre-Project	44300	851.9	852
60589.63	Q100	Post Project	44300	851.4	852
60484.37 BR U	Q100	Post Project	44300	851.2	

River Station	Profile	Model/Plan	Q Total (cfs)	HEC-RAS WS Elev (ft)	FIS WS Elev. (ft)
60484.37 BR D	Q100	Post Project	44300	851.2	
60450.95	Q100	Duplicate Effective	44300	851.5	852
60450.95	Q100	Pre-Project	44300	851.4	852
60379.11	Q100	Post Project	44300	851.2	
60372.45 BR U	Q100	Duplicate Effective	44300	851.5	
60372.45 BR U	Q100	Pre-Project	44300	851.4	
60372.45 BR D	Q100	Duplicate Effective	44300	851.4	
60372.45 BR D	Q100	Pre-Project	44300	851.2	
60261.18	Q100	Pre-Project	44300	851.2	
60261.18	Q100	Post Project	44300	851.2	
60260.95	Q100	Duplicate Effective	44300	851.5	
60174.39	Q100	Pre-Project	44300	851.3	
60174.39	Q100	Post Project	44300	851.3	
60043.89	Q100	Pre-Project	44300	851.4	
60043.89	Q100	Post Project	44300	851.4	
58802.93	Q100	Duplicate Effective	44300	851.3	852
58802.93	Q100	Pre-Project	44300	851.1	852
58802.93	Q100	Post Project	44300	851.1	852
57469.04	Q100	Duplicate Effective	48300	851.2	851.5
57469.04	Q100	Pre-Project	48300	851.0	851.5
57469.04	Q100	Post Project	48300	851.0	851.5
56022.88	Q100	Duplicate Effective	48300	851.0	851
56022.88	Q100	Pre-Project	48300	851.0	851
56022.88	Q100	Post Project	48300	851.0	851

Hydraulic Analysis Conclusions

As previously mentioned, the purpose of the hydraulic analysis was to demonstrate that the proposed bridge and approach roadway construction upstream of the existing bridge will not result in an increase in flood levels within the communities of Lancaster, NH and Guildhall, VT during the base flood discharge. The HEC-RAS computer modeling and analysis results, as summarized herein, indicate there will be no increase in base flood elevation as a result of the proposed improvements.

We trust that this submittal will meet with the Departments approval. Please feel free to contact me should you need any additional information or if you have any questions during your review of this submittal.

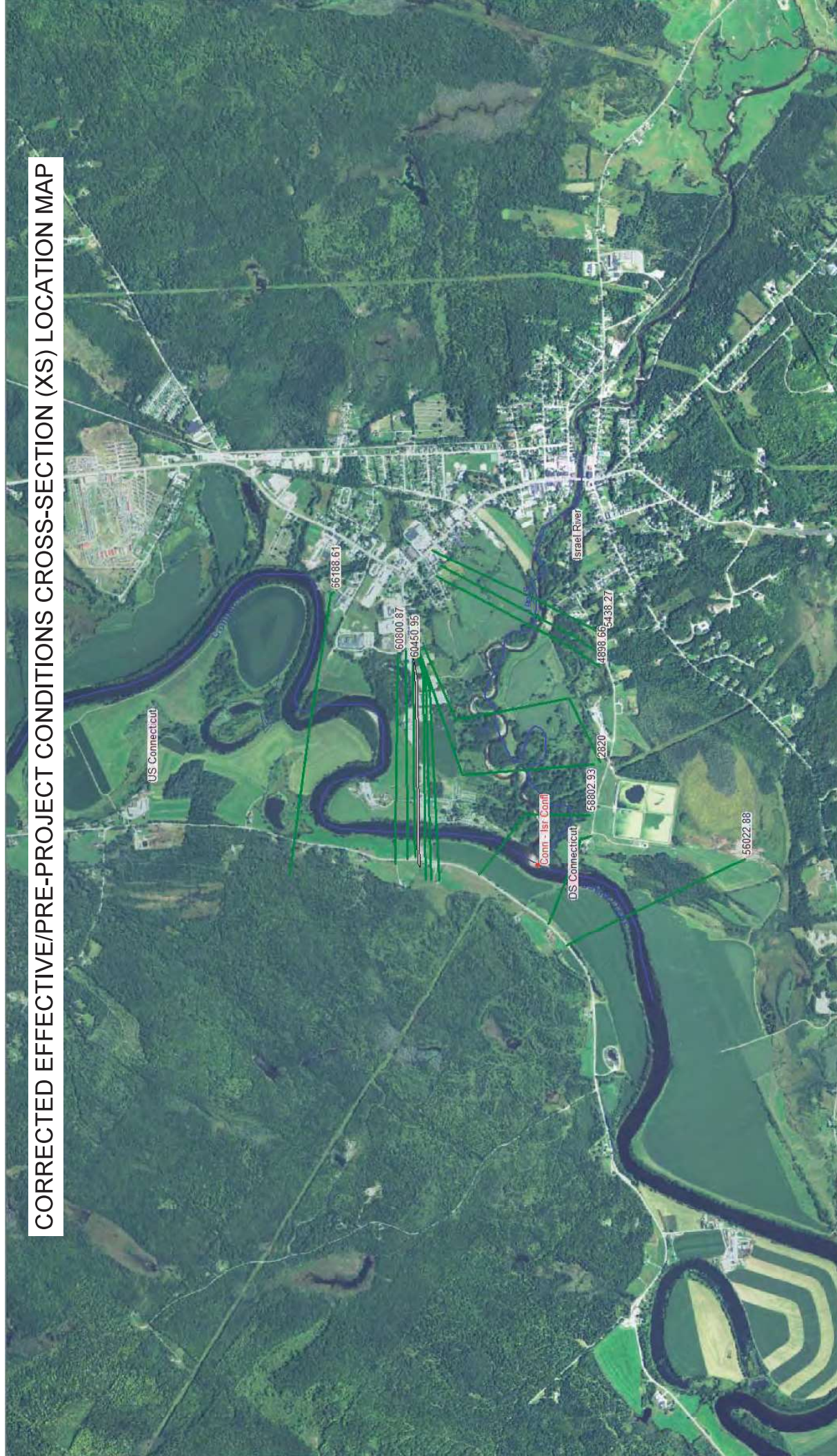
Sincerely,
Hoyle, Tanner & Associates, Inc.



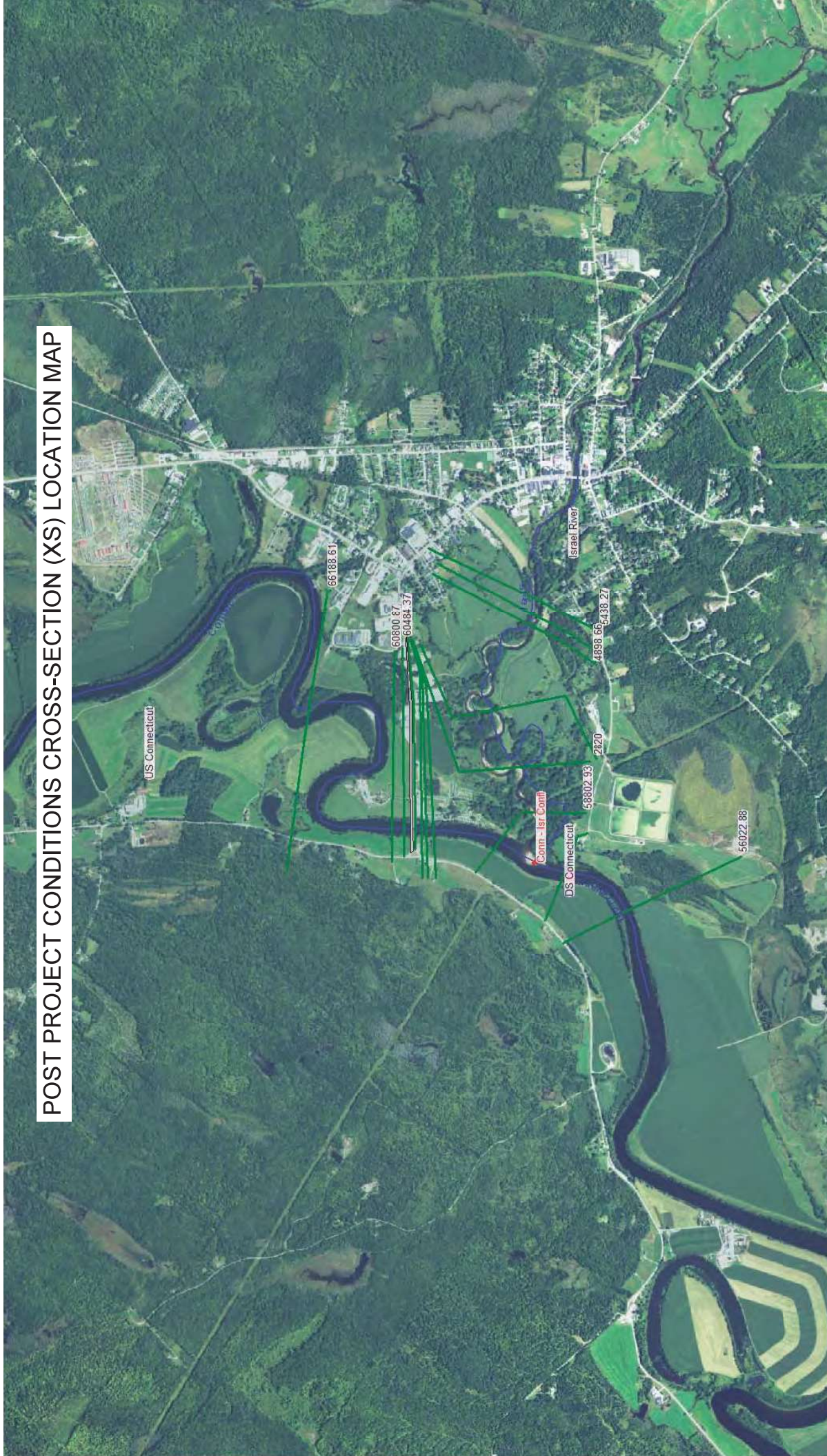
Edward G. Weingartner, P.E.
Project Manager

Enclosures

CORRECTED EFFECTIVE/PRE-PROJECT CONDITIONS CROSS-SECTION (XS) LOCATION MAP



POST PROJECT CONDITIONS CROSS-SECTION (XS) LOCATION MAP





NH NATURAL HERITAGE BUREAU
NHB DATACHECK RESULTS LETTER

Memo

To: Vicki Chase, Normandeau Associates
25 Nashua Road
Bedford, NH 03301-5022

From: Amy Lamb, NH Natural Heritage Bureau
Date: 5/29/2018

Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB18-1603
Description: The New Hampshire Department of Transportation (NHDOT) proposes to replace the Rogers' Rangers Bridge (NHDOT Br. No. 111/129; C.T. River Br. No. 26), which carries US Route 2 over the Connecticut River between the towns of Lancaster, NH and Guildhall, VT.

Location: US Route 2

cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: This site is within an area flagged for possible impacts on the federally-listed *Alasmidonta heterodon* (dwarf wedgemussel) in the Connecticut River. Please contact the NH Fish & Game Department.

Invertebrate Species

	State ¹	Federal	Notes
Dwarf Wedge Mussel (<i>Alasmidonta heterodon</i>)	E	E	Contact the NH Fish & Game Dept and the US Fish & Wildlife Service (see below).

¹Codes: "E" = Endangered, "T" = Threatened, "..." = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

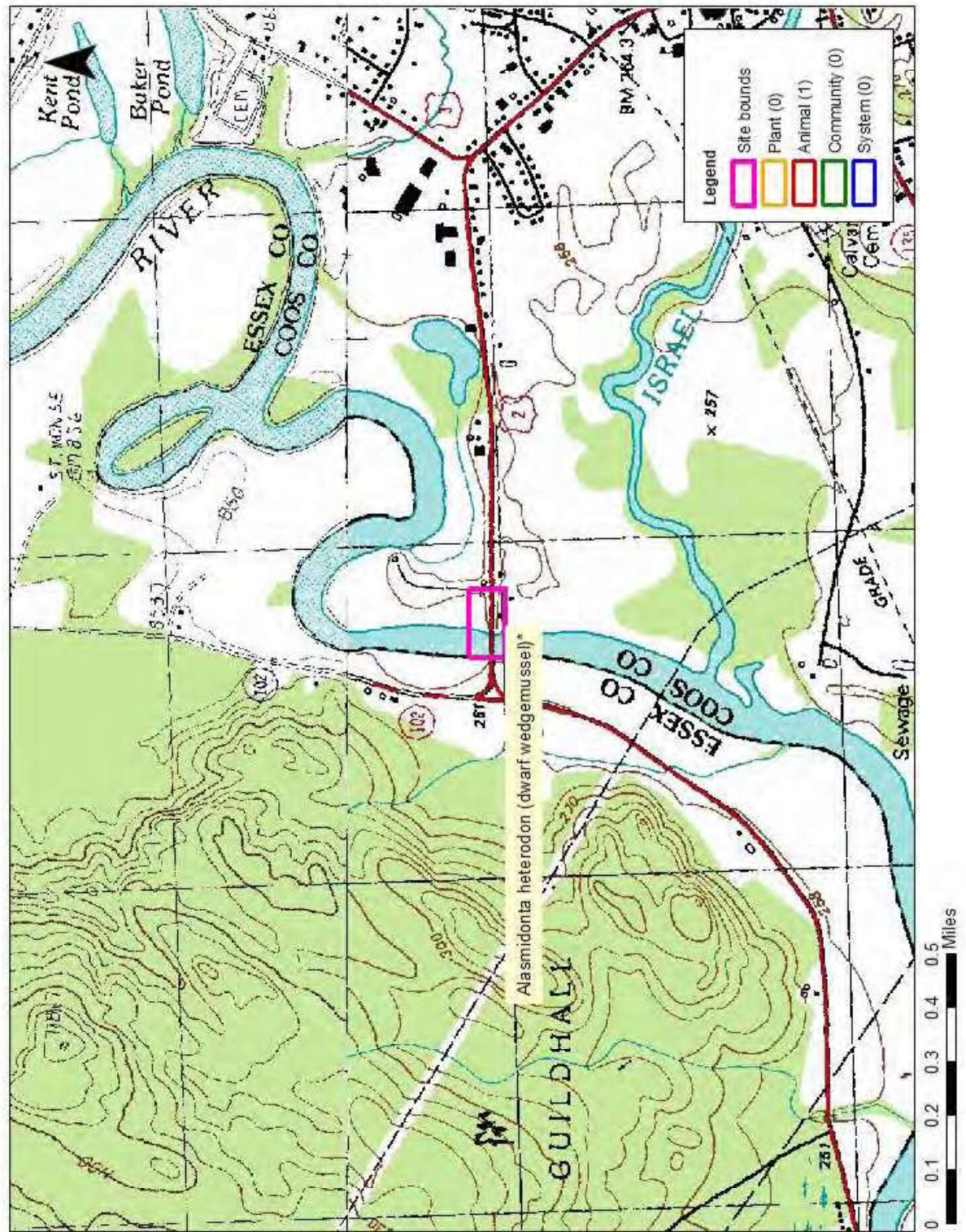
Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord, NH 03301

NHB18-1603





United States Department of the Interior

FISH AND WILDLIFE SERVICE
 New England Ecological Services Field Office
 70 Commercial Street, Suite 300
 Concord, NH 03301-5094
 Phone: (603) 223-2541 Fax: (603) 223-0104
<http://www.fws.gov/newengland>



In Reply Refer To:

May 24, 2018

Consultation Code: 05E1NE00-2017-SLI-2426

Event Code: 05E1NE00-2018-E-04467

Project Name: Lancaster NH - Guildhall VT Bridge over CT River

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2017-SLI-2426

Event Code: 05E1NE00-2018-E-04467

Project Name: Lancaster NH - Guildhall VT Bridge over CT River

Project Type: TRANSPORTATION

Project Description: The New Hampshire Department of Transportation (NHDOT) proposes to replace the Rogers' Rangers Bridge (NHDOT Br. No. 111/129; CT. River Br. No. 26), which carries US Route 2 over the Connecticut River between the towns of Lancaster, NH and Guildhall, VT.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/44.496122689450026N71.59395396709277W>



Counties: Coos, NH | Essex, VT

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Canada Lynx <i>Lynx canadensis</i> Population: Wherever Found in Contiguous U.S. There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3652	Threatened
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Clams

NAME	STATUS
Dwarf Wedgemussel <i>Alasmidonta heterodon</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/784	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

EXHIBIT H

JUN 28 2017

Jennifer McCarthy
Chief, Regulatory Division
US Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751

RE: Essential Fish Habitat Consultations on the Connecticut River in Vermont and New Hampshire

Dear Ms. McCarthy: :

We are writing in regards to the Essential Fish Habitat (EFH) Consultation process in the States of Vermont and New Hampshire within the Connecticut River. As you know, the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Fish and Wildlife Coordination Act require Federal agencies to consult with one another on activities that may have an adverse effect to EFH. This process is guided by the requirements of our EFH regulation at 50 CFR 600.905, which mandates the preparation of EFH Assessments and generally outlines each agencies obligations in this consultation procedure.

In 1998, the New England Fishery Management Council designated EFH for Atlantic Salmon (*salmo salar*) throughout its historic range in New England, including the Connecticut River Watershed in the States of Vermont and New Hampshire. At this time, anadromous Atlantic Salmon are no longer present in the Connecticut River or its tributaries within Vermont and New Hampshire. Therefore, we are not requiring EFH consultations for activities in the Connecticut River and its tributaries within Vermont and New Hampshire. However, we maintain that permanent impacts to diadromous fish habitat be avoided and minimized to ensure viable habitat should the status of the species change. Should this occur, we will notify your office to reassess the EFH consultation process in the Connecticut River in Vermont and New Hampshire.

Should you wish to discuss this matter further, please contact Christopher Boelke at 978-281-9131 or Christopher.boelke@noaa.gov

Sincerely,

Louis A. Chiarella
Assistant Regional Administrator
For Habitat Conservation

cc: Tom Nies, NEFMC





United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
<http://www.fws.gov/newengland>



REF: U.S. Route 2 (Rogers' Rangers) Bridge Replacement
NHDOT Project #16155
Formal Consultation Log # 16-F-1427

March 31, 2017

Mr. Jamison S. Sikora
U.S. Department of Transportation
Federal Highway Administration
53 Pleasant Street, Suite 2200
Concord, NH 03301

Dear Mr. Sikora:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) based on our review of your Biological Assessment (BA), dated May 2016, and additional information received on September 29, 2016 and November 1, 2016, for the proposed U.S. Route 2 (Rogers' Rangers) Bridge replacement project (Project), located over the Connecticut River in Lancaster, New Hampshire, and Guildhall, Vermont. Our BO evaluates the effects of the proposed Project on the federally endangered dwarf wedgemussel (*Alasmidonta heterodon*), in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531, *et seq.*). No critical habitat has been designated for this species.

To implement the Project, the Federal Highway Administration (FHWA) is providing funds to the New Hampshire Department of Transportation (NHDOT) for the replacement of the Rogers' Rangers Bridge (Bridge). This BO addresses only those actions immediately associated with the proposed replacement of the Bridge. This BO does not address operation and maintenance activities that will occur after project construction.

Two other federally listed species are known from the project area: the federally threatened northern long-eared bat (*Myotis septentrionalis*) and Canada lynx (*Lynx canadensis*). Vegetation removal for the Project may affect the northern long-eared bat; however, the FHWA completed the Service's *Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form*, which allows Federal agencies to rely upon the Service's January 5, 2016 intra-Service Programmatic Biological Opinion on the final 4(d) rule for the northern long-eared bat, to determine that the Project may affect the northern long-eared bat, but that any resulting incidental take is not prohibited by the final 4(d) rule. The FHWA concluded that the Project will have no effect on Canada lynx.

We based this BO on information that accompanied your May 10, 2016 request for consultation, including the BA, and information in our files regarding dwarf wedgemussel populations in the vicinity of the Project. A record of this consultation can be made available at the New England Field Office.

Consultation History

May 12, 2016 – The Service receives a request from the FHWA, dated May 10, 2016, to initiate formal consultation for the Project.

July 22, 2016 - The Service sends a letter to the FHWA acknowledging receipt of a consultation package that includes adequate information to begin the consultation, but that additional information is needed to complete the BO.

September 26, 2016 – The Service receives additional information from NIIDOT.

November 1, 2016 – The Service attends a meeting with the FHWA; NHDOT; Hoyle, Tanner and Associates; and Normandeau Associates to discuss project details.

November 8, 2016 – The Service receives additional information from Normandeau Associates.

January 23, 2017 – The Service attends a meeting with the FHWA; NHDOT; Hoyle, Tanner, and Associates; and Normandeau Associates to discuss comments received on the draft BO.

February 14, 2017 – The Service receives additional information from NHDOT.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

As defined in the ESA section 7 regulations (50 CFR 402.02), “action” means “all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas.” The following descriptions of the proposed action are summarized from the BA and additional correspondence from the FHWA and Normandeau Associates.

Construction Activities

The Bridge carries U.S. Route 2 over the Connecticut River between the towns of Lancaster, New Hampshire, and Guildhall, Vermont. It is jointly owned by the NHDOT (80 percent) and the Vermont Agency of Transportation (20 percent). NHDOT is the lead State agency for the Project. Access for construction and demolition of the existing Bridge will be from both sides of the River. The purpose of the Project is to replace the Bridge with a new one that will be located upstream of the current structure.

Pier Construction Sequence

1. Construct access to the pier site with construction barges and/or a temporary trestle.
2. Construct a four-sided steel sheeted cofferdam with internal bracing.
3. Excavate in-the-wet within the cofferdam, to the design bottom of concrete seal elevation. Excavated materials will be deposited into spoil containment equipment on the barge or trestle. Spoil containment equipment on the temporary trestle and/or barge may consist of trucks for hauling the material off for proper treatment and disposal, or other containment measures on the barges and/or trestles, which would include weirs to allow sedimentation of solids and control of water. The concrete seal elevation and spoil containment equipment shall be determined by the contractor based on their construction means and methods. The bottom of concrete seal elevation can be expected to be about 4-5 feet below the existing riverbed elevation.
4. Install permanent steel casings, drill shafts into the bedrock, install reinforcement cages, and pour concrete for the pier drilled shafts. Spoils from this process will be deposited over land in accordance with best management practices.
5. Dewater the cofferdam by pumping into containment, cut and remove the permanent steel casing to the top of concrete seal/bottom of footing elevation. The treated water will be pumped into the River.
6. Construct the pier footing and stem wall in-the-dry.
7. Remove steel sheeting cofferdam.

Construction barges and/or a temporary trestle will remain in place for approximately 24 months, until the new steel girders are erected and they are no longer required by the contractor's means and methods to complete the superstructure construction.

Existing Bridge Removal

1. Construct access to the existing Bridge and pier site with construction barges and/or a temporary trestle.
2. Install temporary shoring towers, within the River, to support the existing Bridge during removal operations. Although the contractor will determine the exact number of shoring towers needed, the FHWA expects this to result in approximately 4,300 square feet of temporary impacts.
3. Mobilize the existing bridge removal equipment on construction barges and/or a temporary trestle.
4. Remove the existing bridge deck, flooring system and trusses using cranes and other equipment. No elements of the existing Bridge will be allowed to fall into the River during removal operations. Removal sections will be set on the barges, the temporary trestle and/or land to complete demolition and disposal operations.
5. Mobilize the pier removal equipment on construction barges and/or a temporary trestle.
6. Install a four-sided water diversion structure, such as a sand-bag cofferdam, to divert flow around the existing pier. The contained area will not be pumped dry.

7. Demolish the existing pier in-the-wet to the mud line and remove the pier debris from within the water diversion structure onto the barge or trestle to be hauled off for proper disposal.
8. Remove access to the existing pier site with construction barges and/or a temporary trestle.

Construction of the new bridge and removal of the existing Bridge is estimated to take 24 months total and will last for two construction seasons. There will be some removal of vegetation along the shoreline of the River. Vegetation removal will be limited to what is necessary for construction access. Staging areas for construction equipment and materials will be set back from the riverbed. All areas will be contained with approved erosion and sediment control measures.

Conservation measures to reduce impacts to dwarf wedgemussels

The FHWA will implement a dwarf wedgemussel relocation and monitoring plan (Plan) before any disturbance occurs. The Plan has not been finalized due to pending dwarf wedgemussel surveys that are being conducted in the vicinity of the project area. The results of those surveys, expected in the spring of 2017, will help inform where any dwarf wedgemussels found during the pre-construction surveys will be relocated. Currently, the most recent survey data available in the vicinity of the project area is from 2009. Once the final survey report is available, the Plan will be finalized.

The Service requested and the FHWA agreed that the pre-construction mussel survey and relocation should focus more intensely on the proposed area of direct impact. This alternative mussel survey and relocation approach is based on accepted survey methods that maximize mussel relocation while making these efforts as efficient as possible. The revised approach is based upon the West Virginia Mussel Survey Protocols (Clayton et al. 2015) and Survey Design for Detecting Rare Freshwater Mussels (Smith 2006).

The FHWA or NHDOT will conduct a pre-construction salvage survey in August or September of 2018, when the water in the River is expected to be at lower levels. The salvage area is reduced to a much smaller footprint than as prescribed by Smith et al. 2001, the survey method referenced in the BA, but incorporates contingencies and triggers intended to maximize survey time in productive habitat areas and minimize survey time in unproductive habitat areas. The proposed revised survey area includes reasonable buffering around the proposed area of direct impacts as described in the West Virginia protocol (Clayton et al. 2015). This approach allows for a more complete salvage of individuals most likely to be adversely affected by construction while at the same time minimizing the need to handle or unnecessarily disturb animals that are not likely to be affected.

The total salvage area is approximately 75,347 square feet (Attachment 1). This area extends 50 feet upstream of the area of direct impact and 100 feet downstream. Standard cell salvage outside of the footprint of direct impact (shown as transparent cells on Attachment 1) will be surveyed as follows:

- The survey would employ a minimum two passes per cell with a minimum search effort of 0.5 minute/square meter.
- Cells with total mussel species densities (all species, not just dwarf wedgemussels) greater than 0.5 mussel per square meter will receive a third pass.

Certain cells will require extra salvage effort to recover as many individuals as possible. These cells will be surveyed with multiple passes to depletion, as defined below:

- A cell will be considered appropriately depleted when the last pass results in 10 percent or less of the total catch of all non-dwarf wedgemussels for the cell is recovered. It is anticipated that up to 40 total cells may require additional passes beyond the initial two passes.
- If one or more dwarf wedgemussel is recovered in any pass, additional passes will be required for that cell until no dwarf wedgemussels are recovered and the less than or equal to 10 percent of the total catch requirement is met.
- If the total catch in any cell exceeds 0.5 mussel per square meter (all species included), this indicates a dense mussel population in that area. One additional pass will be required for that cell unless one of the other triggers is met.
- Any cell with direct substrate impacts such as pilings, excavation, dewatering, cofferdams, or fill placement will be surveyed to depletion. Attachment 1 depicts those cells in orange.

Dwarf wedgemussels recovered will be tagged with numbered shellfish tags prior to relocation. Common mussel species, if any are detected, would be marked and removed from the project area, and relocated to the dwarf wedgemussel relocation site.

Additional assumptions regarding mussel relocation sites, access, and other survey details will be included in the complete Plan to be submitted to the Service prior to ground disturbance.

The FHWA has committed to using Service-approved consultants that are experienced mussel biologists who have conducted multiple relocations and studies for the dwarf wedgemussel in order to minimize handling and relocation stress on individuals. A relocation site has not yet been identified. The relocation site that is chosen will be outside the project area and will contain live dwarf wedgemussels. Relocated mussels will be checked 1 month and 1 year after project completion to monitor mortality, movement, and growth.

Instream and riverbank construction activities will not occur during the period April 1 to May 15, the time of year considered to be the peak of spring spawning for dwarf wedgemussels in their northern range (McLain and Ross 2005). Pre-construction relocation efforts will be conducted during low-water conditions the season prior to the beginning of any construction activities. No in-water or shoreline work will occur unless protective and exclusionary measures are established prior to the noted time-of-year restriction. Project construction is expected to last for 2 years.

Due to the duration of construction activities, it may not be possible to limit in-water work to low flow periods. Low flow periods are preferred in order to reduce the potential for unanticipated release of sediments from exposed soils as a result of high water events or rain runoff. In order to reduce the possibility of dwarf wedgemussels being impacted by such an event, the FHWA has committed to conducting a second relocation effort prior to the second year of construction if more than 25 dwarf wedgemussels are found during the first year's survey.

The FHWA will implement its Best Management Practices (BMPs) to avoid, minimize, and mitigate impacts on the dwarf wedgemussel. BMPs would include:

- material will be staged and/or stockpiled at a staging area that will be at least 50 feet from the edge of the River;
- silt fencing will contain stockpiled material;
- placement of materials in the River shall take place during low flow periods;
- no instream or riverbank work shall occur from April 1 to May 15 in any year for which work has started;
- an erosion control line (i.e., silt fence, silt socks or other acceptable erosion control measures) shall be established a minimum of 5 feet from the toe of the temporary causeways (in uplands) prior to construction;
- rolled erosion control materials (netting or filter fabric) must be limited to 100 percent natural non-plastic and biodegradable materials;
- construction equipment may not enter the Connecticut River;
- no spraying of glyphosphate (e.g., glyphosate) shall occur;
- maintenance and refueling of construction equipment will not occur within 150 feet of wetlands or watercourses and at a location where drainage is adequately protected with secondary containment measures;
- absorbent material will be in place prior to refueling to catch any spills that may occur;
- all construction materials and erosion control materials placed on the ground temporarily will be removed and disposed of in an environmentally responsible manner following the completion of construction;
- a spill prevention plan will be developed for the Project;
- the contractor will have a spill cleanup kit capable of removing contaminants from the Connecticut River (should there be an accidental spill);
- the contractor will implement measures to protect the River from lead paint flakes during demolition of the existing Bridge; and
- staging areas will be set back from the riverbed and will be properly contained with erosion and sedimentation controls.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the ESA requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02).

The jeopardy analysis in this BO relies on four components: (1) the Status of the Species, which describes the range-wide condition of the dwarf wedgemussel, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the dwarf wedgemussel in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the dwarf wedgemussel; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the dwarf wedgemussel; and (4) the Cumulative Effects, which evaluates the effects of future, non-Federal activities, that are reasonably certain to occur in the action area, on the dwarf wedgemussel.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the current status of the dwarf wedgemussel, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of the dwarf wedgemussel in the wild by reducing the reproduction, numbers, and distribution of that species.

STATUS OF THE SPECIES

The Service listed the dwarf wedgemussel as endangered on March 14, 1990 (55 FR 9447-9451). The following is a summary of dwarf wedgemussel general life history drawn from the dwarf wedgemussel recovery plan (Service 1993), the 2007 5-year review for the dwarf wedgemussel (Service 2007), and the 2013 5-year review (Service 2013), unless otherwise stated.

The dwarf wedgemussel is found solely in Atlantic Coast drainage streams and rivers of various sizes and moderate current. It ranges from New Hampshire to North Carolina, in small creeks to deep rivers in stable habitat with substrates ranging from mixed sand, pebble and gravel, to clay and silty sand. In the southern portion of its range, it is often found buried under logs or root mats in shallow water, whereas in the northern portion of its range, it may be found in firm substrates of mixed sand, gravel or cobble, or embedded in clay banks in water depths of a few inches to greater than 20 feet (6 meters). The dwarf wedgemussel is not a long-lived species as compared to other freshwater mussels; life expectancy is estimated at 10 to 12 years (Michaelson and Neves 1995).

The reproductive cycle is typical of other freshwater mussels, requiring a host fish on which its larvae (glochidia) parasitize and metamorphose into juvenile mussels. Since the release of the 1993 Recovery Plan, a number of fish species have been positively identified as hosts for the dwarf wedgemussel. Michaelson and Neves (1995) confirmed the tessellated darter (*Etheostoma olmstedi*), Johnny darter (*E. nigrum*), and mottled sculpin (*Cottus bairdi*) as host fish for dwarf wedgemussels in the southern part of its range. Wicklow (in the New Hampshire Wildlife Action Plan, New Hampshire Fish and Game Department 2006) confirmed the slimy sculpin (*C. congatus*) and Atlantic salmon (*Salmo salar*) juveniles and parr as possible host fish for dwarf wedgemussels in New Hampshire. The shield darter (*Percina peltata*), striped bass (*Morone*

saxatilis), banded killifish (*Fundulus diaphanus*), and brown trout (*Salmo trutta*) were identified as hosts for dwarf wedgemussels of the Delaware River watershed (White 2007). White (2007) also observed significant differences in the rate of host fish infestation by dwarf wedgemussel glochidia taken from three different major river basins.

The dwarf wedgemussel is considered to be a long-term brooder. In general, dwarf wedgemussel glochidia may be released between March and June, with peak release times varying from south to north. Michaelson and Neves (1995) documented the reproductive cycle of the dwarf wedgemussel from North Carolina and observed that dwarf wedgemussels spawn in late summer, become gravid in September, and release glochidia in April. Wicklow (New Hampshire Fish and Game Department 2006) observed glochidia release beginning in March and continuing through June in the Ashuelot River in New Hampshire. In a study of dwarf wedgemussel reproduction in the Mill River, Massachusetts, McLain and Ross (2005) observed that most glochidia were released in April and May.

Reproductive output appears to be correlated with local population abundance. McLain and Ross (2005) documented that sites with the highest abundance of adult dwarf wedgemussels also demonstrated the highest proportion of gravid females, glochidial density, fish host infection, and density of juvenile mussels.

Human activity has significantly degraded dwarf wedgemussel habitat, causing a general decline in populations and a reduction in distribution of the species. Primary factors responsible for the decline of the dwarf wedgemussel include: (1) impoundment of river systems; (2) pollution; and (3) alteration of riverbanks and channels.

Damming and channelization of rivers throughout the dwarf wedgemussel's range have resulted in the elimination of much of its formerly occupied habitat. In general, dams and river channelization activities result in the loss or alteration of mussel habitat (Watters 2001), although dwarf wedgemussels can be found in habitat altered by dams. Immediately upstream of a dam, conditions such as heavy silt deposition, low current, and low oxygen levels are not conducive to the maintenance of dwarf wedgemussel populations. Immediately downstream of these dams, remaining habitat may be subject to periodic water level and temperature fluctuations and scour, conditions stressful or intolerable to dwarf wedgemussels, which are relatively thin-shelled and sensitive to environmental variation. Dams may deepen the river channel through flooding or dewater river channels for reasons ranging from hydroelectric production to routine maintenance of dam infrastructure. Some dams can cause colder water temperatures in the channel bottom and impacts to nutrients and oxygen. Dams may also create wetlands along the former upland and floodplain fringe through flooding, yielding habitat that is predominantly soft and composed of muds and sands. The majority of remaining viable dwarf wedgemussel populations occur in river systems fragmented by dams, including the Ashuelot River (NH), Connecticut River (NH/VT), Mill River (MA), Farmington River (CT), Podunk River (CT), Neversink River (NY), Paulins Kill River (NJ), and the Tar River (NC).

Domestic and industrial pollution was the primary cause for mussel extirpation at many historic sites (USFWS 1993). Mussels are known to be sensitive to a wide variety of heavy metals and pesticides, and to excessive nutrients and chlorine (Havlik and Marking 1987). Mussel die-offs

have been attributed to chemical spills, agricultural waste runoff, ammonia, dewatering of channels, and low dissolved oxygen levels. In one instance in August of 2001, more than 20 dwarf wedgemussels and hundreds of other mussels (including State-listed species) were killed in the Mill River by waste runoff from a small farm (MADFW 2015).

Some pollutants indirectly impact the mussels. For example, nitrogen and phosphorus cause organic enrichment, excessive plant growth, and shifting of prey communities, and in extreme cases, oxygen depletion. Recent research on the effects of total suspended solids (TSS) indicates that elevated levels of TSS (organic or inorganic) could interfere with the fertilization of eggs by either decreasing the chance that females encounter suspended sperm, or sperm are bound to mucus and egested (Gascho Landis et al. 2013).

Alteration of riverbanks and channels also can have a variety of impacts on dwarf wedgemussels. Riverbank alteration includes bank erosion control measures, such as riprap, and removal of vegetation, particularly shade trees and bushes. Placement of unwashed riprap along the bank can result in increased sedimentation in the water column, while placement of stones in the river can bury mussel beds and habitat and result in permanent loss of suitable habitats.

Siltation, generated by road construction, agriculture, forestry activities, and removal of streambank vegetation, is considered to be an important factor in the decline of many freshwater mussel species, including the dwarf wedgemussel (USFWS 1993). Sediment loads in rivers and streams during periods of high discharge may be abrasive to mollusk shells. Erosion of the outer shell allows acids to reach and corrode underlying shell layers (Harman 1974). Irritation and clogging of gills and other feeding structures in mussels occur when suspended sediments are siphoned from the water column (Loar et al. 1980), severely affecting the mussel's normal activity or even causing death.

Because freshwater mussels are relatively sedentary and cannot move quickly or for long distances, they cannot easily escape when silt is deposited over their habitat. Ellis (1936) found that mussels could not survive in substrate on which silt accumulated to depths over 0.6-2.5 cm. He observed dying mussels with large quantities of silt in their gills and mantle cavities and attributed their deaths to interference with feeding and to suffocation. In addition, Ellis determined that siltation from soil erosion reduced light penetration, altered heat exchange in the water, and allowed organic and toxic substances to be carried to the bottom where they were retained for long periods of time. This resulted in further oxygen depletion and possible absorption of these toxicants by mussels.

A further probable adverse effect on many mussel species is the impact of sedimentation or pollution on host fish species. Some fish species are vulnerable to changes in light, turbidity and pollutants. Any water quality degradation that affects the host fish species may affect dwarf wedgemussels.

Most of the extant dwarf wedgemussel populations are small and geographically isolated from each other. This isolation restricts exchange of genetic material among populations, and reduces genetic variability within populations. Strayer (1994) conducted a rangewide assessment of the dwarf wedgemussel, examining 13 rivers and streams from New Hampshire to North Carolina.

Strayer concluded that all 13 populations of the dwarf wedgemussel are vulnerable to loss because of their small range, low population densities, linear ranges, or some combination of the three factors. However, for all but one of the populations studied, densities determined by Strayer were large enough so that he did not expect them to be affected by problems such as inbreeding or demographic stochasticity. Even though there was evidence of reproduction at most sites, Strayer felt that these populations demonstrated lower fertilization rates than other freshwater mussel species.

More recently, surveys for dwarf wedgemussels were conducted at 210 locations over an approximately 120-mile stretch of the Connecticut River in New Hampshire and Vermont in preparation for the relicensing of several hydroelectric dams. Some of these sites had been investigated by Strayer (1994) during his rangewide assessment surveys. Surveys included one 17-mile free-flowing stretch (the section that separates existing occurrences in the impounded areas behind the hydroelectric dams) and three impounded stretches (Biodrawiversity, LLC et al. 2014). Dwarf wedgemussels were not found in the free-flowing stretch of the Connecticut River, although transect surveys as recently as 2001 documented dwarf wedgemussels at or near three of the sites surveyed in 2013. The dwarf wedgemussel population in the same stretch of River was considered by Strayer (1994) to be less vulnerable to inbreeding or demographic stochasticity. However, given the recent findings that dwarf wedgemussels may be absent or in extremely low numbers in the free-flowing stretch of the Connecticut River, it is possible that the genetic diversity of the remaining Connecticut River occurrences will ultimately be diminished as well. It is not known why dwarf wedgemussels have apparently disappeared from this portion of the Connecticut River.

Drought or manipulated water flows resulting in abnormally low water levels also appear to have adverse effects on dwarf wedgemussel populations. Galbraith et al. (2015) investigated the response of several freshwater mussel species to experimental dewatering and observed that most species became stranded under low and moderate rates of dewatering and all individuals were stranded under rapid dewatering. This was evident in the Upper Tar River watershed in North Carolina, where severe population declines have been documented following a substantial drought in 2007 (Service 2013). Although mussels have evolved to respond to natural low water events, which tend to happen along predictable cycles, severe droughts or dewatering resulting from anthropogenic causes (e.g., dam removals, reconstruction or inspections, or construction activity occurring within occupied mussel habitat) may result in desiccation of mussels on or in the substrate, increased rates of predation, loss of productivity, or change in the fish species composition, including host fish.

Changing climate also may be impacting the dwarf wedgemussel and impacts may increase in the future. Although northern streams and rivers normally have spring freshets (high water caused by melting snow and ice), it appears that climate change may be increasing the frequency of unusually high water events in late spring, early summer, and fall. It is likely that changes in precipitation patterns will bring about more extreme and more frequent flood and drought events (Karl et al. 2009). Milly et al. (2005) predict that runoff will increase from 10 to 40 percent in rivers of eastern North America, and Najjar et al. (2000) also predict increases in streamflow in mid-Atlantic coastal streams. Droughts will be more common in the southern portion of the dwarf wedgemussel's range, particularly in North Carolina (Karl et al. 2009). Given this, it is

reasonable to conclude that climate change will have a negative impact on the dwarf wedgemussel. Moreover, increasing water temperatures are likely to alter or restrict the ranges of coldwater fish species (Eaton and Scheller 1996), many of which serve as hosts for larval mussels.

The Service completed nine non-jeopardy formal consultations for projects within the Connecticut River watershed since 1996 (Table 1). The most recent consultation was on a gas pipeline looping project that would cross Muddy Brook and Stony Brook in Suffield, Connecticut. The project has not been completed, and therefore there is no pre- or post-construction data available to report at this time.

Table 1. Previous biological opinions completed for dwarf wedgemussels in the Connecticut River watershed in New Hampshire, Massachusetts and Vermont.

Year	Waterbody	Project	Incidental Take		Project Completed
			Amount/Extent of Take	Documented	
1996	Connecticut River	Bank stabilization (VT)	0.6 acre of habitat, 7 percent of relocated mussels, unknown number of mussels not relocated would be lost under riprap.	Seven-year study indicated high rate of survival of over 500 relocated mussels. Estimated mortality much lower than anticipated incidental take.	Yes
2002	Ashuelot River	Flood control (NH)	Take in the form of harassment and possible loss of productivity.	No mortality or decline in productivity or local population documented during post-construction surveys through 2009.	Yes
2003	Connecticut River	Bank stabilization (NH)	14,700-square-foot loss of habitat, relocation of a minimum of 50 dwarf wedgemussels with expected mortality of 3 percent to 7 percent, unknown number of mussels lost beneath riprap, most likely more than relocated.	Twenty mussels relocated upriver, all mussels found in post-construction survey. No mortality due to relocation. Estimated mortality lower than anticipated incidental take.	Yes
2006	Mill River	Fish passage (MA)	Relocation of less than five mussels anticipated. Unknown number of mussels equal to or less than those relocated may be lost due to construction activity.	No mussels found, therefore none relocated; a few mussels may have been lost due to construction. River flow and fish passage restored, long-term beneficial effects anticipated.	Yes
2009	Ashuelot River	Dam removal (NH)	Take of estimated 50 individuals anticipated based on the low numbers of dwarf wedgemussels encountered during pre-construction surveys. Take due to mortality and temporary loss of occupied, suitable habitat, and harm from siltation, short-term water quality degradation and relocation (stress, disturbance).	496 dwarf wedgemussels were relocated prior to and after the dam removal, far more than was anticipated. Post-construction surveys have not been completed.	Yes
2015	Muddy Brook	Bridge reconstruction	Take in the form of mortality of a small number of dwarf wedgemussels not encountered during the pre-construction relocation effort will occur within the area receiving temporary and permanent fill. Take in the form of harassment may also occur should	Project has not been initiated as of May 2015.	No

Year	Waterbody	Project	Incidental Take		Project Completed
			Amount/Extent of Take	Documented	
			relocation interrupt the reproductive cycle of relocated dwarf wedgemussels.		
2015	Mill River	Mill River bank stabilization	Take in the form of mortality of dwarf wedgemussels not encountered during the pre-construction relocation effort will occur within the project area. Take in the form of harassment may also occur should relocation interrupt the reproductive cycle of relocated dwarf wedgemussels.	309 dwarf wedgemussels were relocated prior to project construction. Post-construction surveys have not been completed.	Yes
2016	Ashuelot River	Cresson Covered Bridge	Take in the form of mortality of a small number of dwarf wedgemussels not encountered during the pre-construction relocation effort will occur within the project area. Take in the form of harassment may also occur should relocation interrupt the reproductive cycle of relocated dwarf wedgemussels.	Project has not been initiated as of July 2016.	No
2016	Muddy Brook and Stony Brook	Tennessee Gas Connecticut Expansion Project	Take in the form of mortality of dwarf wedgemussels not encountered during the pre-construction relocation effort will occur within the project area. Take in the form of harassment may also occur should relocation interrupt the reproductive cycle of relocated dwarf wedgemussels.	Project has not been initiated as of December 2016.	No

Rangewide Status and Recovery Objective

At one time, this species was recorded from 70 localities in 15 major drainages ranging from North Carolina to New Brunswick, Canada. The species' current range includes Atlantic Coast streams and rivers from New Hampshire to North Carolina. Since the 1993 Recovery Plan, a number of new locations have been discovered and a number of known locations are possibly no longer extant.

The dwarf wedgemussel is currently found in 15 major drainages (Table 2). It is not possible to assess the number of "sites" because of the lack of a clear definition for "site." This is due in part to the discovery of large, contiguous stretches of river hosting scattered occurrences of dwarf wedgemussels that function as one "population," such as in the main stem of the Connecticut River in New Hampshire. However, specific sites or stretches of the Connecticut River identified in the Recovery Plan as critical to recovery and essential for maintaining viable populations no longer coincide with new location information.

Table 2. Dwarf wedgemussel major drainages.¹

State	Major Drainage	County
NH	Upper Connecticut River	Coos, Grafton, Sullivan, Cheshire
VT	Upper Connecticut River	Essex, Orange, Windsor, Windham
MA	Middle Connecticut River	Hampshire, Hampden
CT	Lower Connecticut River	Hartford
NY	Middle Delaware	Orange, Sullivan, Delaware
NJ	Middle Delaware	Warren, Sussex
PA	Upper Delaware River	Wayne
MD	Choptank River	Queen Anne's, Caroline
MD	Lower Potomac River	St. Mary's, Charles
MD	Upper Chesapeake Bay	Queen Anne's
VA	Middle Potomac River	Stafford
VA	York River	Louisa, Spotsylvania
VA	Chowan River	Sussex, Nottoway, Lunenburg
NC	Upper Tar River	Granville, Vance, Franklin, Nash
NC	Fishing Creek	Warren, Franklin, Halifax
NC	Contentnea Creek	Wilson, Nash
NC	Upper Neuse River	Johnson, Wake, Orange

The main stem of the Connecticut River in New Hampshire and Vermont is considered to have the largest remaining dwarf wedgemussel population, consisting of three distinct stretches of sporadically occupied habitat segmented by hydroelectric dams. The Ashuelot River in New Hampshire, the Farmington River in Connecticut (both within the Connecticut River basin), and the Neversink River in New York (Delaware River basin) are also considered to harbor viable populations. Because of qualitative survey methods used to assess the populations, it is not possible to estimate the number of individuals in these populations (Service 2013). However, recent surveys indicate that in some locations in these rivers, dwarf wedgemussel subpopulations may be declining. Ethan Nedeau of Biodrawiversity, LLC documented significant declines at long-term survey locations on the Ashuelot River between 2004 and 2012 (E. Nedeau, in litt., October 6, 2014). During surveys conducted for the relicensing of several dams on the Connecticut River, no dwarf wedgemussels were located in the 17-mile free-flowing stretch between the Wilder Dam and the Bellows Fall Dam impoundments (the southernmost population of dwarf wedgemussels on the Connecticut River), whereas historically, a number of sites in this reach had consistently supported dwarf wedgemussels (Strayer 1994; Gabriel 1996; Biodrawiversity, LLC et al. 2014).

¹ The 15 major drainages identified in Table 2 do not necessarily correspond to the original drainages identified in the 1993 Recovery Plan, although there is considerable overlap. Watersheds are based on USGS and EPA Cataloguing Units; see http://water.usgs.gov/GIS/huc_name.html and <http://cfpub.epa.gov/surf/locate/index.cfm> (accessed March 2017).

The remaining populations from New Jersey south to North Carolina are estimated at a few individuals to a few hundred individuals. It appears that the populations in North Carolina, Virginia, and Maryland are declining, as evidenced by low densities, lack of reproduction, or the inability to relocate any dwarf wedgemussels in follow-up surveys.

According to the species' recovery plan, in order to reclassify the dwarf wedgemussel as threatened from endangered, the following populations must be shown to be viable (a population containing a sufficient number of reproducing adults to maintain genetic variability, and annual recruitment is adequate to maintain a stable population) (Service 1993):

- Main stem Connecticut River (NH/VT)
- Ashuelot River (NH)
- Neversink River (NY)
- Upper Tar River (NC)
- Little River (NC)
- Swift Creek (NC)
- Turkey Creek (NC)
- Six other rivers/creeks representative of the species' range

The recovery plan states the dwarf wedgemussel could be considered for delisting from the Federal list of threatened and endangered species, when the following criteria are met:

1. at least 10 of the rivers/creeks in the preceding criterion must support a widely dispersed viable population so that a single catastrophic event in a given river will be unlikely to result in the total loss of that river's population;
2. the rivers should be distributed throughout the species' current range with at least two in New England (New Hampshire, Vermont, Massachusetts, Connecticut), one in New York, and four south of Pennsylvania; and
3. all populations referred to in the criterion to downlist the species to threatened and the preceding two criteria must be protected from present and foreseeable anthropogenic and natural threats that could interfere with their survival.

The Service's 5-year status reviews for the dwarf wedgemussel (Service 2007; 2013) noted that few recovery criteria have been met, and moreover, some of the criteria need revision.

ENVIRONMENTAL BASELINE

The environmental baseline describes the status of the species and/or its habitat in the area affected by the proposed action.

Action Area

The implementing regulations for section 7(a)(2) of the ESA define the "action area" as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the proposed Project is defined as the area between the banks of the Connecticut River 300 feet north and 350 feet south of the

existing U.S. Route 2 Bridge, or approximately 200,000 square feet. The action area also includes the staging areas, which will be within this footprint. The total area where direct impacts to dwarf wedgemussels could occur (within the action area) is approximately 30,709 square feet.

Existing Conditions in the Action Area

The FHWA and NHDOT did not conduct surveys or a habitat assessment for dwarf wedgemussels in the action area, and other known information about the species in the action area is limited. The Project is located in the upper Connecticut River in New Hampshire and Vermont. Although this portion of the River is considered to have the largest remaining population of dwarf wedgemussels (Service 2007) and the highest concentration of dwarf wedgemussels in the Connecticut River, the upper section is poorly surveyed (Biodrawversity 2009). Very few surveys have been conducted in the reach from the Wyoming Dam in Northumberland, New Hampshire, downstream to the project area. There is a high potential for dwarf wedgemussels to occur in this area, but it is not known how continuous the population is. Survey efforts for an unrelated project are underway, although preliminary results are unavailable. However, a report is expected to be available in the summer of 2017.

In the vicinity of the project area, the Connecticut River is about 270 feet wide, with depths ranging between 8 and 25 feet. The river substrate is sand and silt, with some cobble and gravel. Dwarf wedgemussels have been found at depths of up to 25 feet in the Connecticut River (Biodrawversity 2009).

The existing Bridge was built in 1950 and it is comprised of two steel trusses with span lengths of 198 feet each and an overall length of 398 feet. There are remnants of the former bridge just upstream, with wooded cribbing that was likely the base of a pier. This area is surrounded by a forested riparian buffer zone, then agricultural land.

Status of the Species in the Action Area

The FHWA and NHDOT did not conduct surveys or a habitat assessment as part of the environmental planning and permitting process for the proposed Project. Therefore, the FHWA and the Service are assuming presence of the species due to the Project's location in an area where there is a high potential for dwarf wedgemussels to occur. Dwarf wedgemussels have been documented both upstream and downstream of the project area. The nearest documented downstream occurrence is a historical, undated record of a single animal, approximately one-tenth of a mile downstream of the project site. A survey conducted in 2000 as part of a National Pollutant Discharge Elimination System permit re-issuance for the Lancaster Wastewater Treatment Facility, located approximately four tenths of a mile downstream of the project area, did not locate any dwarf wedgemussels. Studies show that freshwater mollusks are not highly tolerant of effluents from sewage treatment facilities, and that river reaches up to 2 miles downstream of such facilities are devoid of freshwater mussels (Goudreau et al. 1992). Spot surveys conducted in 2014 found one dwarf wedgemussel approximately 1½ miles upstream of the project area.

The nearest known extant population of dwarf wedgemussels is in Lunenburg, Vermont. In 1997, 536 dwarf wedgemussels were relocated in Lunenburg, approximately 5 river miles south of the project area. Four years of follow-up studies conducted at the site (1998, 1999, 2001, and 2004) revealed a significantly larger population of dwarf wedgemussels than what was initially present, indicating either a high level of recruitment or a highly inflated reproductive situation created by the placement of the relocated animals (Biodrawiversity 2004).

If habitat conditions in the project area are similar to those at the Lunenburg site, dwarf wedgemussels are likely to occur. However, we expect low numbers of dwarf wedgemussels to occur in the project area and its vicinity due to the presence of a nearby sewage treatment facility, and because spot surveys conducted both upstream and downstream of the project area located only single specimens.

EFFECTS OF THE ACTION

In evaluating the effects of the Federal action under consideration in this consultation, 50 CFR 402.2 and 402.14(g)(3) requires the Service to evaluate the direct and indirect effects of the proposed action on the species. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). Direct and indirect adverse effects may occur to dwarf wedgemussels as a result of the Project.

Construction

The areas of construction impacts include 30,709 square feet of the Connecticut River, and we expect project activities to impact all dwarf wedgemussels, to some extent, in these project areas. Within these areas, direct adverse effects would occur to the species and its habitat as a result of the construction activities. Adverse effects leading to injury or death of individual dwarf wedgemussels may occur in the form of habitat disturbance or direct impacts. Although the FHWA will survey for and relocate dwarf wedgemussels prior to construction, we expect some dwarf wedgemussels will not be encountered during surveys and will be injured or killed through physical disturbance by construction equipment, during excavation, by dam building, etc. That said, we expect the FHWA's efforts to relocate dwarf wedgemussels from the construction area to a suitable location to substantially minimize the impacts of construction on the dwarf wedgemussel in the action area and limit the injured or dead dwarf wedgemussels to a relatively small number.

We expect project construction activities to result in indirect effects on dwarf wedgemussels as sediments are mobilized and transported, and as the River and its banks adjust to post-construction conditions after project completion. Indirect effects to adult and larval mussels may result from rain events both during and after project construction as sediment is mobilized and transported into the River even though sediment control measures will be in place. Some erosion is expected to occur, thereby temporarily increasing turbidity in the action areas.

Dwarf wedgemussels that survive construction and remain in the project area may experience habitat degradation to the point that they may not survive unless they are able to relocate. As dwarf wedgemussels are not highly mobile, they may be harmed or killed by increased

sedimentation that is released from high water or rain events during construction or prior to the point the site has been stabilized. In addition, indirect effects of the Project, including temporary disturbance of the river bed, siltation of the water column, and sedimentation of the river bed, could reduce the species' ability to feed, breed, and shelter, and also could temporarily cause host fish to vacate the project areas, temporarily reducing the species' reproductive fitness in the action area. However, impacts to dwarf wedgemussels will be avoided or minimized by limiting the time of year during which instream construction occurs, to avoid the dwarf wedgemussel peak reproductive season. Further, erosion control measures will be employed that will substantially reduce siltation to the Connecticut River.

We do not expect a spill or release of hydrocarbon products or other hazardous substances as part of the Project and spills are not covered by this BO; however, a spill or release of hydrocarbon products or other hazardous substances into the Connecticut River during project construction is possible. If such an event occurs, the FHWA will take immediate remedial action and contact the Service and the New Hampshire Department of Environmental Services for recommendations on minimizing impacts to dwarf wedgemussels. Separate consultation may be necessary if a spill occurs.

Conservation Measures

Direct adverse effects to individual dwarf wedgemussels may also occur during the relocation effort. Mussels may be stressed as they are handled, marked, transported and re-embedded into the relocation site, or they may be stressed as a result of being moved to an unfamiliar location. However, the chance of this occurring is reduced by the FHWA identifying Service-approved relocation sites and Service-approved individuals to conduct the survey and relocation efforts. We expect the relocation sites to provide the essential dwarf wedgemussel habitat components, because they will be selected based on the presence of dwarf wedgemussels and other co-occurring mussel species found in the original habitat location. However, the time frame needed for dwarf wedgemussels to adjust to their new environment is unknown. In the interim, dwarf wedgemussels may temporarily cease to feed, may be exposed to increased predation risk, or may expend additional energy moving within the relocation site or out of it as they seek an optimal microhabitat.

It is anticipated that there will be some localized short-term impacts resulting from the construction activities. Photographs of the vicinity of the project area indicate that the banks are well vegetated and stable. Once the Project is completed, the FHWA will restore pre-construction conditions and stabilize disturbed areas to prevent erosion into the Connecticut River. We expect this to cause minor, short-term, indirect impacts to dwarf wedgemussel habitat; however, active restoration will hasten habitat recovery and reduce indirect impacts over the long term.

Effects on Recovery of the Dwarf Wedgemussel

The downlisting and recovery criteria for the dwarf wedgemussel focus on population viability, maintaining sufficient distribution of the species, and habitat protection. The proposed Project would last a short period of time, would not have permanent impacts, would injure or kill a relatively small number of dwarf wedgemussels, and would affect a very small portion of the

species' population and habitat rangewide. Accordingly, we do not expect the Project to have substantial impacts on the reproduction, numbers, or distribution of the species; and the Project, as proposed, would not limit the potential for downlisting or recovery of the dwarf wedgemussel.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered in this section, because they require separate consultation pursuant to section 7 of the ESA. The Service is not aware of any future State, local or private actions that could occur within the action area that would not be subject to a section 7 review. Therefore, cumulative effects, as defined in the ESA, are not expected to occur within the action area and will not be addressed further in this BO.

CONCLUSION

After reviewing the current status of the dwarf wedgemussel in the Connecticut River watershed and throughout its range, the environmental baseline for the action area, and the effects of the proposed action on the dwarf wedgemussel, it is the Service's opinion that the proposed Project is not likely to jeopardize the continued existence of the dwarf wedgemussel. We reached this conclusion because:

1. The impacts of the proposed Project would occur within 30,709 square feet, which is a very small portion of the habitat available in the upper part of the Connecticut River, and an even smaller portion of the species' larger geographic range.
2. The FHWA is implementing a survey and relocation plan to move as many dwarf wedgemussels out of the project area as possible prior to construction. In addition, the FHWA has committed to conducting a second relocation effort if more than 25 dwarf wedgemussels are found at the project location. Relocating dwarf wedgemussels prior to construction to an area where they are known to occur may enhance reproduction at that site (McLain and Ross 2005) by concentrating individuals and increasing the mussel density. Therefore, the effect of a temporary reduction in reproduction within the project area may be partially offset by a future increase in reproduction at the relocation site.
3. The Project would not cause permanent reduction in the number of dwarf wedgemussels. We conclude that there will be short-term effects to the local population in the action area as a result of the Project due to mortality of individuals. However, the relocation of some of the dwarf wedgemussels will minimize the amount of individuals lost to the population, and as previously noted, may increase productivity at the relocation site. Further, we expect the impacts to be temporary, and we expect the species to recolonize the impact areas after project completion.
4. The Project would not appreciably reduce the distribution of the dwarf wedgemussel. A very small portion of the rangewide habitat for this species would be impacted by the Project. It is anticipated that the action area will be restored to pre-construction

conditions, both by the FHWA's restoration efforts and natural processes. Over the long term, we anticipate the dwarf wedgemussel population within the action area will recover as the species recolonizes the impact areas.

5. The FHWA will implement measures that would avoid or minimize adverse effects, including the time-of-year restriction to avoid affecting glochidial release by female dwarf wedgemussels and glochidial attachment to host fish, the relocation of mussels prior to construction, and measures to reduce or avoid sedimentation. The Project is not anticipated to occur during peak glochidia release; therefore, direct impacts will be limited to the loss of juveniles and adults not found during pre-construction surveys.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened fish or wildlife species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service as an act that actually kills or injures wildlife and may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. Harass is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3).

Incidental take is defined as takings that results from, but are not the purpose of, carrying out an otherwise lawful activity. Under section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of this incidental take statement. Because incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity, this incidental take statement is valid only upon receipt by the applicant of all appropriate authorizations and permits from Federal, State and local permitting authorities.

Amount or Extent of Incidental Take Anticipated

The Service anticipates that incidental take of dwarf wedgemussels throughout the action area will be difficult to detect because of the species' cryptic coloration; small size; low mobility; and aquatic, semi-fossorial nature. Current monitoring methodology generally does not give precise population counts, and detecting a significant change in the population may take years or decades for such a long-lived species. In addition to the species' small body size, a substantial percentage of the dwarf wedgemussel population within the action area is likely to occur below the surface of the substrate at any given time, precluding exact mussel counts without destructive survey methods. Juvenile dwarf wedgemussels are extremely difficult to detect and identify, therefore it is nearly impossible to document take of this life stage.

All dwarf wedgemussels in the action area are subject to capture during relocation efforts. However, the Service anticipates that incidental take of the dwarf wedgemussel is likely to occur during construction in the form of direct wounding and killing of an unknown number of individuals (those that are not moved out of the construction area) and harm to an unknown number of individuals due to physical and physiological disturbance of mussels through their relocation, siltation, and short-term water quality degradation. We expect relocation of dwarf wedgemussels to avoid direct mortality of most mussels from the construction and fill activities and dewatering of the construction area. However, incidental take in the form of some harassment and harm of relocated mussels is expected, although this will be nearly impossible to document.

Detectability of the dwarf wedgemussel is encumbered by the species' cryptic nature, small size (e.g., glochidia attached to fish), low mobility, and behavior of migrating vertically within the substrate, which complicates the Service's ability to calculate the precise number of individuals that are likely to be taken as a result of the Project. Despite these challenges, the Service must provide a level at which formal consultation would have to be reinitiated. Based on the information presented in the Environmental Baseline and Effects Analysis sections of this BO, the Service surmises that take by wounding or killing of the dwarf wedgemussel is likely to be low, given the methods that will be implemented through the relocation plan, along with the low number of individuals expected to occur within the action area. The Service recognizes that for every dwarf wedgemussel captured, or found wounded or killed, there may be others that will not be found and will be killed or wounded. To account for the inability to count every dwarf wedgemussel that will actually be taken as a result of the Project, the Service sets the take threshold at which the FHWA must reinitiate consultation below the number of dwarf wedgemussels that may actually be taken.

Surveys were not conducted at the project area, but the Service assumes presence of dwarf wedgemussels due to previous studies that have documented their presence both above and below the site. Preliminary results for surveys conducted in 2016 in Lunenburg, Vermont, located approximately 4 miles from the project area, found a total of 298 dwarf wedgemussels. The Lunenburg site was used as a relocation site in 1997, when 536 dwarf wedgemussels were moved there prior to a bank stabilization project. This same survey effort did not find dwarf wedgemussels at sites located upstream of the project area, the nearest of which was approximately 7 miles away. The long stretch of river between Lunenburg and the nearest upstream site is assumed to have dwarf wedgemussels, as they have been historically documented as close as one-tenth of a mile away. The sparsity of survey data in the vicinity of the project area makes it difficult to estimate what the population at this site may be.

For the purposes of this BO, if a total of 25 adult, subadult, or juvenile dwarf wedgemussels are found wounded or killed, the FHWA must contact the Service's New England Field Office (see contact information below) immediately to reinitiate formal consultation. Project activities that are likely to cause additional take should cease during this review period, because the exemption provided under section 7(o)(2) would lapse and any additional take would not be exempt from the section 9 prohibitions.

In the event that the FHWA expects to exceed the proposed 30,709-square-foot disturbance footprint, or expects impacts to occur outside of the action area as defined in the accompanying BO, reinitiation of this consultation will be needed, as those impacts were not considered in this incidental take statement or the accompanying BO.

In the event that an unanticipated release of sediment that could not be contained occurs and it is determined that aquatic habitat downstream of the Project has been impacted, an area to be determined in consultation with the Service and the New Hampshire Department of Environmental Services would be surveyed to assess potential impacts to dwarf wedgemussels. Remediation measures may need to be developed and implemented to reduce adverse effects to dwarf wedgemussels from an unanticipated release of sediments. Any take occurring as a result of such an event is not covered by this incidental take statement or the accompanying BO and may not be exempt from the section 9 prohibitions.

REASONABLE AND PRUDENT MEASURES

The measures described below are non-discretionary, and must be undertaken by the FHWA or made binding conditions of any agreement made with NHDOT, as appropriate, for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA (1) fails to assume and implement the terms and conditions; or (2) fails to require NHDOT to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the FHWA or NHDOT must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement (50 CFR 402.14(i)(3)).

The Service believes the following reasonable and prudent measures are necessary and appropriate to further minimize impacts of incidental take of the dwarf wedgemussel:

1. siltation or contamination of the Connecticut River must be avoided or minimized to the maximum extent feasible to avoid stress or death of dwarf wedgemussels; and
2. the number of dwarf wedgemussels that may be killed as a result of excavation or fill, or exposed to desiccation must be minimized to the maximum extent possible.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the ESA, the FHWA and NHDOT must comply with the following, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. Siltation and/or contamination control measure:
 - a. Ensure that all conservation measures described in the project proposal summarized in this BO and in the supporting documentation are implemented.

2. Minimization of burial or desiccation of dwarf wedgemussels:

- a. Surveys must be implemented prior to construction in accordance with a protocol that will be outlined in the survey and relocation plan. Survey results must be submitted to this office at least 15 days before construction begins.
- b. If more than 25 dwarf wedgemussels are found during pre-construction surveys, additional surveys must be conducted before in-water construction activities begin for the second year of construction.
- c. Any individuals the FHWA and NHDOT intend to employ to survey for, capture, and/or relocate dwarf wedgemussels must be approved in advance by the Service. The FHWA and NHDOT should send a request for approval to the Service, including the individual's qualifications demonstrating adequate experience with the species and a list of references, at least 30 days prior to that individual participating in project activities.
- d. The FHWA provided qualifications for Christopher D. Baker, William S. Ettinger, Alan Frizzell, and Joe Snavelly, and requested they be approved to conduct activities with the dwarf wedgemussel as part of the Project. We determined that Mr. Snavelly has demonstrable experience to independently survey for, capture, and relocate the dwarf wedgemussel. Additionally, he has familiarity with Group 4 river systems such as the Connecticut River and has recently conducted surveys for dwarf wedgemussels in connection with other projects. Therefore, Mr. Snavelly is hereby authorized to independently conduct the requested activities in association with the subject Project. Mr. Baker, Mr. Ettinger, and Mr. Frizzell are authorized to conduct the requested activities under the supervision of Mr. Snavelly. These approvals are valid only for the activities requested pursuant to the BO accompanying this incidental take statement, and are valid only for the duration of the subject Project.

REPORTING REQUIREMENTS

Pursuant to 50 CFR 402.14(i)(3), the FHWA must report the progress of the action and its impact on the dwarf wedgemussel to the Service as specified in this incidental take statement. A report summarizing the Project must be provided to the Service (see contact information below) within 90 days of the Project's completion (conclusion of all activities in the action area associated with replacing the Bridge). The report should include at a minimum: (1) construction start and finish dates; (2) documentation of unusual storm events occurring during the construction, and efforts implemented to minimize adverse effects resulting from storm events; (3) a summary of revegetation efforts (species, numbers of plants); (4) discussion of any release of sediments downstream; and (5) photo documentation of the project area.

Separate reports regarding the relocation of dwarf wedgemussels should also be submitted to the Service (see contact information below). An interim report should be submitted within 30 days of the initial relocation effort and 30 days after the follow-up survey. The reports should include at a minimum: (1) the number of mussels moved and/or encountered (would include resident mussels); (2) the length, breadth and width of individuals; (3) tag numbers; (4) at least several representative photographs of individual mussels if a full photoset is not available; (5) a

summary and photo of the relocation site at the time of relocation and after each survey; (6) latitude/longitude of the relocation site; (7) photocopies of raw data sheets; and (8) unusual observations (if any).

If freshly killed dwarf wedgemussels are found in the project area, care must be taken in their handling to preserve biological material in the best possible condition. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The reporting of dead specimens is required to enable the Service to determine if incidental take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead, injured, or sick specimen of an endangered or threatened species, prompt notification must be made to:

Thomas R. Chapman, Supervisor
New England Field Office
U.S. Fish and Wildlife Service
70 Commercial St., Suite 300
Concord, NH 03301
(603) 223-2541

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid the adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service has identified the following actions which, if undertaken by the FHWA, would further the conservation and assist in the recovery of the dwarf wedgemussel.

1. Seek opportunities to preserve dwarf wedgemussel populations and occupied habitats throughout the species' historic range (Dwarf Wedgemussel Recovery Plan, Task 2).
2. Within watersheds supporting populations of dwarf wedgemussel, implement projects to improve water quality by reducing non-point source pollution. Potential projects may include, but are not limited to, wetland preservation or wetland restoration and streambank restoration (via establishment of native plant species). This action would partially meet the objectives of the recovery plan (Dwarf Wedgemussel Recovery Plan, Task 1.3).

REINITIATION NOTICE

This concludes formal consultation on the Federal action outlined in the October 6, 2015 initiation letter. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if (1) the amount or extent of incidental take is exceeded; (2) new

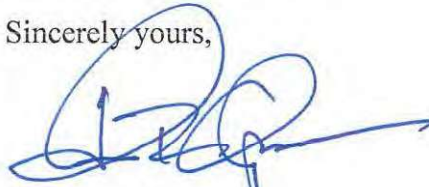
Mr. Jamison S. Sikora
March 31, 2017

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information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this BO; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this BO; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) may have lapsed and any further take could be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

If you have any questions about this BO, please contact Ms. Maria Tur of this office at 603-227-6419, or by e-mail at maria_tur@fws.gov.

Sincerely yours,



Thomas R. Chapman
Supervisor
New England Field Office

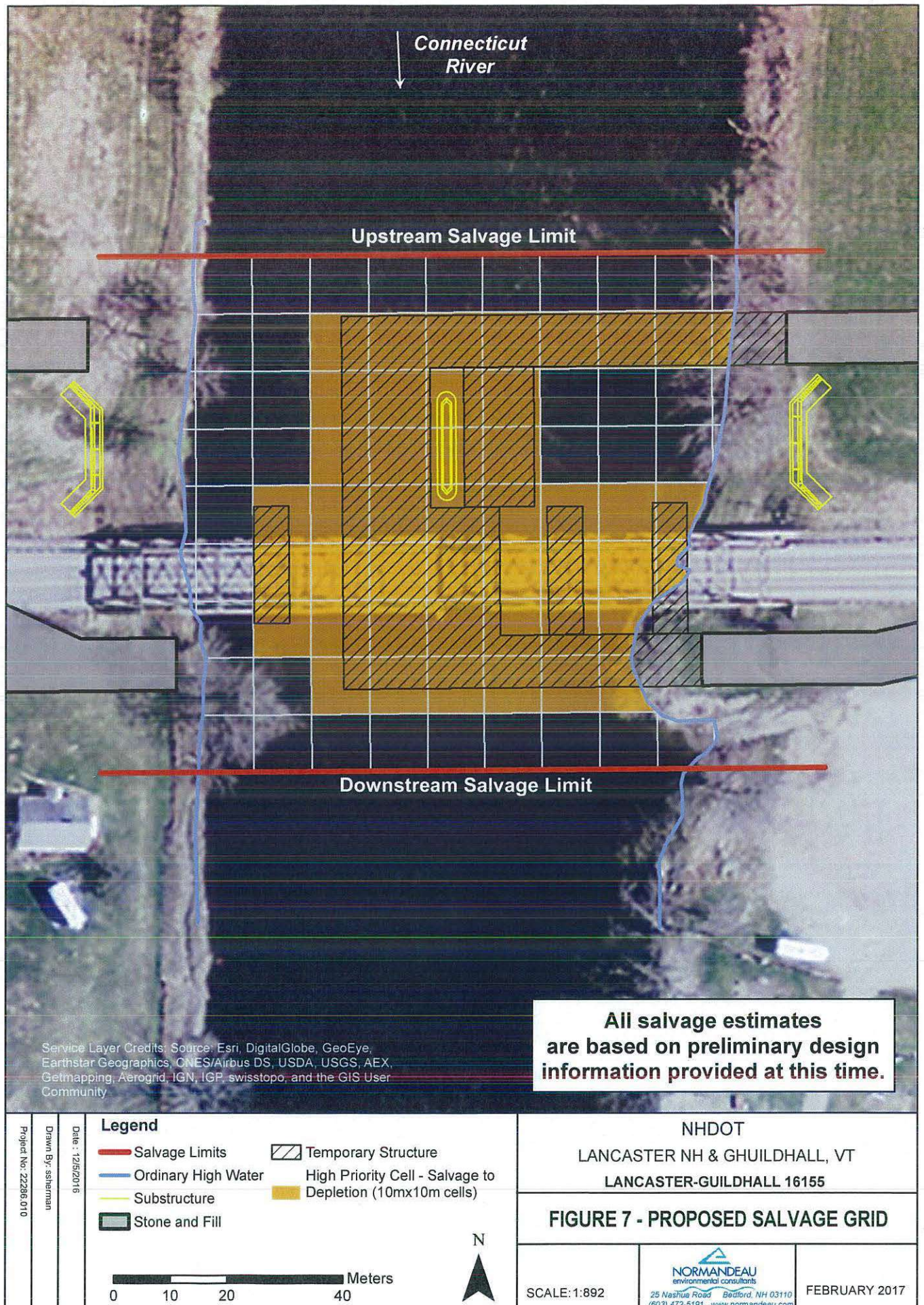
Attachment

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Victoria F. Sheehan
Commissioner

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION



William Cass, P.E.
Assistant Commissioner

Lancaster, NH – Guildhall, VT
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VTrans #BHF A001(159)
RPR4191

Adverse Effect Memo

Pursuant to meetings and discussions on October 11, 2012, July 11, 2013, September 12, 2013, December 5, 2013, March 12, 2015, April 30, 2015, October 23, 2015, and April 21, 2016 and for the purpose of compliance with regulations of the National Historic Preservation Act, as amended, and the Advisory Council on Historic Preservation's *Procedures for the Protection of Historic Properties* (36 CFR 800), the NH and VT Divisions of the Federal Highway Administration, Vermont Agency of Transportation, NH Department of Transportation (NHDOT) and the NH Division of Historical Resources (NH SHPO) have coordinated the identification and evaluation of historic and archeological properties with plans to replace the Rogers Rangers bridge carrying US Route 2 over the Connecticut River (111/129) between Lancaster, New Hampshire and Guildhall, Vermont. The Vermont Agency of Transportation (VTrans) has reviewed this project according to the standards and procedures detailed in the 2000 Programmatic Agreement (PA) regarding Implementation of the Federal Highway Administration's (FHWA) Federal-Aid Highway Program in Vermont and the corresponding Manual of Standards and Guidelines (Manual).

Project Description:

This project consists of the replacement of the Rogers' Rangers Bridge No. 111/129 truss bridge along US Route 2 over the Connecticut River between Lancaster (Coos County), New Hampshire and Guildhall (Essex County), Vermont. The new concrete deck and steel girder bridge will be constructed on the upstream (north) side of the existing bridge and the existing bridge will be used as a temporary crossing during construction. The project will also improve stormwater collection and treatment by creating treatment swales in the old roadbed on the New Hampshire side and improve the intersection of US Route 2 with VT Route 102 in Guildhall by redesigning the triangle intersection into a T-intersection, thus reducing conflict points. The APE includes a large area north of the existing bridge for new construction encompassing an area of approximately 150 feet x 270 feet. The APE also includes an area of approximately 50 feet off the edge of roadway along the approach on the south side of the bridge.

Analysis:

Based on a review pursuant to 36 CFR 800.4 of the architectural and/or historical significance of resources in the area of potential effect, we agree that the Rogers Rangers Bridge is eligible for listing on the National Register of Historic Places. A detailed description of the bridge (Individual Inventory Form, LAN0011) is on file at the New Hampshire Division of Historical Resources in Concord, New Hampshire and attached to this memo.

The NHDOT initiated a Phase IA Archaeological Sensitivity Assessment in 2012, undertaken by Independent Archaeological Consulting, LLC. Findings determined that all four quadrants of the bridge were sensitive for

archaeological resources associated with the Pre-Contact Period as well as the Post-Contact Period, related to the possible 1759 river crossing by Major Robert Rogers and his Rangers. As proposed impacts were limited to the north side of the bridge, Phase IB Intensive Archaeological Survey focused on the north side of the bridge on both the New Hampshire and Vermont sides of the Connecticut River.

In the northeast bridge quadrant (NH), the Pre-Contact Period US RT 2 Connecticut River Site (27-CO-099) was identified and Phase IB/Phase II investigations revealed a widespread dispersed concentration of non-diagnostic lithic debitage, ceramics, and two thermal features that were truncated by agricultural plowing. No further survey was recommended.

In the northwest quadrant (VT), the Sandy Knoll at Roger's Ranger's Bridge Site (VT-ES-0064) was identified and Phase IB/Phase II investigations revealed Pre-Contact Period resources including 5 hearths, 3 pits, stone tools, lithic debitage, ceramics as well as European American artifacts in the thick agricultural plow zone. Radio carbon dating established occupancy between the Middle Archaic (6,310 +/- 30 years B.P.) and the Late Woodland (590 +/- 30 years B.P.). Spatial distribution suggests several distinct short-term activity episodes across multiple eras of Vermont's Pre-Contact Period. The VTrans Archaeology Officer determined that this site was eligible for the National Register based on criterion D – the likelihood to yield further information pertaining to history or pre-history.

As the extent of the Sandy Knoll archaeological site has not been determined, additional Phase II/Phase III testing will be required. Additional archaeological work was planned for the summer of 2016, however, it was not completed due to access restrictions to the parcel. Those have since been resolved, but because of winter weather conditions, the work will need to be completed in the spring of 2017.

Public Consultation: Public Information meetings were held on November 8, 2012 and June 5, 2013 in New Hampshire and Vermont, respectively. Public Hearings were held on March 25, 2014 and November 13, 2014 in New Hampshire and Vermont, respectively.

Determination of Effect:

Applying the criteria of effect at 36 CFR 800.5, we have determined that the project will have an adverse effect on the bridge, from its removal and replacement. The undertaking is also considered to be an Adverse Effect to site VT-ES-0064.

Archaeological Stipulations:

1. All archaeological studies will be completed prior to the beginning of any ground disturbing activities or any other construction activity on the Vermont side within the boundaries of site VT-ES-0064, and on the south side of the bridge if access for pier removal is proposed in this area.
2. All archaeological studies will be completed in accordance with the Secretary of the Interior's Standards as outlined in 36 CFR 800, the Guidelines for Archaeological Documentation (48 FR 44734-37) and the Vermont State Historic Preservation Officer's (SHPO) Guidelines for Archaeological Studies (revised 2016).
3. Vtrans will use their existing statewide retainer contract to hire an archaeological consultant to complete the additional work within the APE.

4. All documentation, including but not limited to scopes of work, end of field letters, reports, recommendations and mitigation measures, will be reviewed and approved by the VTrans Archaeology Officer prior to the beginning of field work and prior to final clearance of archaeological work.
5. Any modification in areas of disturbance or new areas of disturbance will require archaeological review and may require additional studies if impacts cannot be avoided. This includes any additional area along the north side of the bridge, and proposed for access for pier removal on the south side of the bridge
6. All Off-Site Activities including proposed waste, borrow, staging, and access areas will be reviewed and approved by the VTrans Archaeology Officer and/or NH SHPO prior to use.
7. In the event of discovery of a previously unidentified site or human remains in Vermont during project construction the following stipulations for the Vermont side will be followed:
 - 7a. If previously unidentified archaeological sites are discovered during project construction, that portion of the project will stop immediately. The Resident Engineer will notify the VTrans Archaeology Officer. No further construction will proceed until the requirements for 36 CFR 800 have been satisfied.
 - 7b. If human remains or ceremonial objects are discovered either during archaeological excavation or during construction, the project will stop immediately and procedures described in the Vermont Statutes including 13 VSA 3761, Unauthorized Removal of Human Remains, and 18 VSA 52126b, Unmarked Burial Sites Special Fund and reporting of Unmarked Burial Sites shall be followed. Coordination between VTrans and the VT SHPO will follow the Advisory Council's Policy Statement on Treatment of Human Remains and Grave Goods, (1998). All excavation in the vicinity will cease immediately. Remains will be left in place and protected and will follow the procedure below:

“When an unmarked burial site is first discovered, the discovery shall be reported immediately to a law enforcement agency. If, after completion of an investigation pursuant to section 5205 of this title, a law enforcement agency determines that the burial site does not constitute evidence of a crime, the law enforcement agency shall immediately notify the state archaeologist who may authorize the appropriate action regarding the unmarked burial site (18 VSA 52126b)”
 - 7c. If the human remains are identified as Native American, then a treatment and reburial plan will be developed in full consultation with the appropriate Native American group(s) in compliance with the requirements of NAGPRA.
8. In the event of discovery of a previously unidentified site or human remains in New Hampshire during project construction the following stipulations for the New Hampshire side will be followed:
 - 8a. If previously unidentified archaeological sites are discovered during project construction, that portion of the project will stop immediately. The Resident Engineer will notify the NHDOT Cultural Resources Program Specialist/Archaeologists or Cultural Resources Program Manager and the State Archaeologist at NHDHR so that the proper steps may be taken by these two agencies to determine proper procedures and identify the appropriate notification process. Cover and protect the burial. Investigations will not continue until verbal notification is provided by the NHDOT. This procedure must be followed. FHWA with NHDOT and NHDHR is responsible for notifying descendants or specific groups, not the investigating archaeologist. When the burial is Native American whether or not the group is federally recognized, RSA 227-C:8–d enjoins the State Archaeologist to immediately notify

the leaders, officials, or spokesperson to determine the appropriate treatment of the burial (see also RSA 227-C:8-g). When the burial is not Native American, the State Archaeologist and often the NHDOT Bureau of Right of Way seek identification of descendants to determine wishes for disposition of the burial (see also RSA 227-C:8-e and 8-g). If skeletal analysis is deemed appropriate, this study may only be undertaken by a qualified analyst in consultation with the NHDHR and NHDOT (see RSA 227-C:8-f).

- 8b. With regard to unanticipated archaeological features and artifacts, regulations 36 CFR 800.13 (b) state that if historic properties are located after the conclusion of the Section 106 process as “post review discoveries,” for example those arising during construction, the federal agency official will make every reasonable effort to avoid, minimize, or mitigate the effect of the project on the properties. In such situations in which the NHDOT must recover archaeological remains in a short time period and they do not involve human remains, the identified features and artifact concentrations will be recovered following the guideline for Phase III excavations as closely as possible. Construction monitoring of the affected area may follow this recovery if the type of archaeological deposit, landscape, vegetation, and project allow this approach to be effective.

Mitigation Measures:

Appropriate mitigation for the removal of the eligible bridge will be recorded in a Memorandum of Agreement. Proposed mitigation includes:

- A. Archival documentation of the bridge (Vermont Standard Mitigation Measure #1 and NH Hampshire Historic Property Documentation Standards)
- B. Interpretive signage (VT Standard Mitigation Measure #2)
- C. Marketing the structure for reuse (VT Standard Mitigation Measure #9)
- D. Compatible design of the new bridge (VT Standard Mitigation Measure #19) including review of the 30%, 60% and 90% bridge plans.

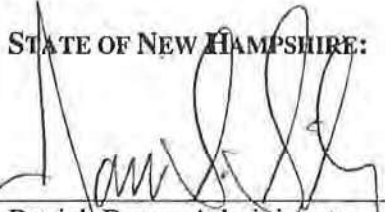
Mitigation Measures for archaeological resources will consist of the following, but will not be limited to:

- E. Phase III data recovery (VT Standard Mitigation Measure 15)
- F. Public Education (VT Standard Mitigation Measure 6), that may also include:
 - a. Lectures (VT Standard Mitigation Measures 5)
 - b. Popular Publications (VT Standard Mitigation Measures 7)
 - c. Website (VT Standard Mitigation Measures 8)
 - d. Exhibits (VT Standard Mitigation Measures 10)

Section 4(f) (to be completed by FHWA)	<i>There Will Be:</i>	<input type="checkbox"/> No 4(f);	<input checked="" type="checkbox"/> Programmatic 4(f);	<input type="checkbox"/> Full 4 (f); <u>or</u>
	<input type="checkbox"/> A finding of <i>de minimis</i> 4(f) impact as stated: In addition, with NHDHR concurrence of no adverse effect for the above undertaking, and in accordance with 23 CFR 774.3, FHWA intends to, and by signature below, does make a finding of <i>de minimis</i> impact. NHDHR's signature represents concurrence with both the no adverse effect determination and the <i>de minimis</i> findings. Parties to the Section 106 process have been consulted and their concerns have been taken into account. Therefore, the requirements of Section 4(f) have been satisfied.			


In accordance with the Advisory Council's regulations, consultation will continue, as appropriate, as this project proceeds.

STATE OF NEW HAMPSHIRE:

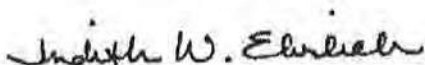

Patrick Bauer, Administrator
Federal Highway Administration

1/24/17
Date

STATE OF VERMONT:

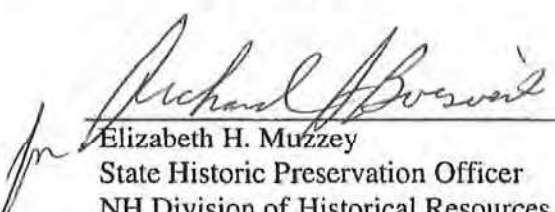

Jeannine Russell-Pinkham
VTrans Archaeology Officer
VT Agency of Transportation

1/24/17
Date



Judith Williams Ehrlich
VTrans Historic Preservation Officer
VT Agency of Transportation

1/24/17
Date

Concurred with by:


Elizabeth H. Muzzey
State Historic Preservation Officer
NH Division of Historical Resources

1-27-17
Date


Jill Edelman
Cultural Resources Manager
NH Department of Transportation

1/27/17
Date

Attachments: Detailed Description of Rogers Rangers Bridge, NH Individual Inventory Form, LAN0011

c.c. Jamie Sikora, FHWA
Bob Landry, NHDOT
Christine St. Louis, NHDHR

Rob Sikora, FHWA
Dan Landry, VTrans
Marc Laurin, NHDOT
Jeff Ramsey, VTrans

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Lancaster, NH – Guildhall, VT
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**MEMORANDUM OF AGREEMENT
AMONG
THE FEDERAL HIGHWAY ADMINISTRATION,
THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION,
THE VERMONT AGENCY OF TRANSPORTATION,
AND THE
NEW HAMPSHIRE STATE HISTORIC PRESERVATION OFFICER
REGARDING THE U.S. ROUTE 2 BRIDGE REPLACEMENT BETWEEN
LANCASTER, NEW HAMPSHIRE AND GUILDHALL, VERMONT**

WHEREAS, the Federal Highway Administration (FHWA), in cooperation with the New Hampshire Department of Transportation (NHDOT) and the Vermont Agency of Transportation (VTrans) plans to provide funds for the replacement of the bridge that carries U.S. Route 2 over the Connecticut River between Lancaster, New Hampshire and Guildhall, Vermont; and

WHEREAS, the VTrans has reviewed this project according to the standards and procedures detailed in the 2000 Programmatic Agreement (PA) regarding Implementation of the FHWA's Federal-Aid Highway Program in Vermont and the corresponding Manual of Standards and Guidelines (Manual); and

WHEREAS, the undertaking consists of construction of a new concrete deck and steel girder bridge upstream (north) of the existing truss bridge, which will remain open during construction. The existing truss bridge, pier and abutments will be removed once the new bridge is opened. Stormwater collection and treatment will be improved by created swales in the old roadbed. The intersection of U.S. Route 2 and VT Route 102 will be redesigned from a Y intersection into a T intersection; and

WHEREAS, FHWA has defined the undertaking's area of potential effect (APE) to include a large area north of the existing bridge for new construction encompassing an area of approximately 150 feet x 270 feet. The APE also includes an area of approximately 50 feet off the edge of roadway along the approach on the south side of the bridge; and

WHEREAS, FHWA has determined that the undertaking will have an adverse effect on the U.S. Route 2 Roger's Rangers Bridge (NH Bridge Number 111/129), which is eligible for listing in the National Register of Historic Places, and has consulted with the New Hampshire State Historic Preservation Officer (NH SHPO) pursuant to 36 C.F.R. part 800, of the regulations implementing Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108); and

WHEREAS, the VTrans Archaeology Officer has determined that the undertaking will have an adverse effect on the Sandy Knoll at Roger's Ranger's Bridge Archaeological Site (VT-ES-0064), which is eligible for listing in the National Register of Historic Places; and

WHEREAS, FHWA has consulted with Federally-recognized Indian tribes (Tribes) with ancestral lands in Vermont about this project, has requested their comments, and has taken any comments received into account; and

WHEREAS, NHDOT and VTrans have reached out to the towns and other interested groups via letters and at public meetings to seek Consulting Party status; no Consulting Parties have been identified; and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(1), FHWA has notified the Advisory Council on Historic Preservation (ACHP) of its adverse effect determination with specified documentation and the ACHP has chosen not to participate in the consultation pursuant to 36 CFR § 800.6(a)(1)(iii); and

NOW, THEREFORE, FHWA, NHDOT, VTrans and the NH SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on historic properties.

STIPULATIONS

FHWA shall ensure that the following measures are carried out:

- A.** Archival documentation of the bridge (The following meets Vermont Standard Mitigation Measure #1 per their PA)
 - a. One archival document shall be completed by a 36 CFR 61-qualified architectural historian to Historic American Engineering Record (HAER) standards, format to be determined by the National Park Service (NPS).
 - b. A digital draft HAER document shall be submitted to NHDOT for review and comment, 30 days. Comments shall be addressed and the draft then sent to NH SHPO (paper copy) and VTrans (digital) for review and comment, 45 days. One draft copy will then be provided by NHDOT, on behalf of FHWA, to NPS for review.
 - c. One final copy completed to HAER standards shall be submitted to NHDOT/FHWA for submission to the National Park Service. Two copies printed on archival paper and a digital PDF shall be submitted to NHDOT for distribution to NH SHPO (hard copy), VTrans (hard copy), and two local repositories (digital).

B. Interpretive signage

- a. NHDOT shall ensure that an interpretive sign be designed, fabricated and installed in Lancaster and Guildhall. , The sign shall focus on the importance and history of the crossing and the 1950 high Parker Truss and shall be designed in consultation with FHWA, NH SHPO, the town of Lancaster, the Lancaster Historical Society and the town of Guildhall. The location of each sign shall be determined in consultation with the town.
- b. A digital draft shall be provided to NHDOT for review and comment, 30 days. Prior to finalization, a draft sign shall be provided to FHWA, VTrans, and NH SHPO for review and comment, 30 days. This stipulation meets Vermont Standard Mitigation Measure #9

C. Marketing the structure for reuse

- a. NHDOT shall offer the bridge for reuse in accordance with 23 USC Section 144, this meets VT Standard Mitigation Measure #2. NHDOT shall develop a marketing plan which shall seek to market the bridge for a minimum of 30 days. This shall include advertising on the NHDOT and VTrans websites, local and regional newspapers, and national preservation publications. Ownership transfer for the re-use of the bridge will require the use of restrictive preservation and maintenance covenants lasting for 20 years to ensure protection of the character-defining features of the bridge. Any applicants interested in the bridge will also have to submit a rehabilitation plan, showing how they will meet the Secretary of the Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings," and will assume all future legal and financial responsibilities for the bridge. Federal Aid highway funds shall be made available for its removal and relocation up to the estimated cost of demolition.
- b. The marketing plan shall be developed no later than June 30, 2017. A 45 day review period shall be provided for the draft submittal to FHWA, VTrans and NH SHPO.

D. Compatible design of the new bridge including review of the 30%, 60% and 90% bridge plans, will meet VT Standard Mitigation Measure #19.

- a. Design plans, at 30%, 60% and 90%, shall be submitted to VTrans, NHDOT, FHWA and NH SHPO for review and comment, 30 days.

E. Archaeological Resources

- a. All archaeological studies shall be completed prior to the beginning of any ground disturbing activities or any other construction activity on the Vermont side within the boundaries of site VT-ES-0064, and on the south side of the bridge if access for pier removal is proposed in this area.
- b. All archaeological studies shall be completed in accordance with the Secretary of the Interior's Standards as outlined in 36 CFR 800, the Guidelines for Archaeological Documentation (48 FR 44734-37) and the Vermont State Historic

Preservation Officer's Guidelines for Archaeological Studies (revised 2016).

- c. VTrans shall use their existing statewide retainer contract to hire an archaeological consultant to complete the additional work within the APE.
- d. All documentation, including but not limited to scopes of work, end of field letters, reports, recommendations and mitigation measures, shall be reviewed and approved by the VTrans Archaeology Officer prior to the beginning of field work and prior to final clearance of archaeological work.
- e. Any modification in areas of disturbance or new areas of disturbance shall require archaeological review and may require additional studies if impacts cannot be avoided. This includes any additional area along the north side of the bridge, and proposed for access for pier removal on the south side of the bridge
- f. All Off-Site Activities including proposed waste, borrow, staging, and access areas shall be reviewed and approved by the VTrans Archaeology Officer and/or NH SHPO prior to use.
- g. Any Phase III data recovery shall adhere to VT Standard Mitigation Measure 15.
- h. A public education component (VT Standard Mitigation Measure #6), may include the following measures. These shall be determined based upon recommendations and finding of the completed archaeological investigations:
 - i. Lectures (VT Standard Mitigation Measure #5)
 - ii. Popular Publications (VT Standard Mitigation Measure #7)
 - iii. Website (VT Standard Mitigation Measure #8)
 - iv. Exhibits (VT Standard Mitigation Measure #10)

IV. DURATION

This MOA will expire if its terms are not carried out within five (5) years from the date of its execution. Prior to such time, FHWA may consult with the other signatories to reconsider the terms of the MOA and amend it in accordance with Stipulation VIII below.

V. POST-REVIEW DISCOVERIES

Vermont: In the event of discovery of a previously unidentified site or human remains in Vermont during project construction the following stipulations for the Vermont side shall be followed:

- a. If previously unidentified archaeological sites are discovered during project construction, that portion of the project will stop immediately. The Resident Engineer shall notify the VTrans Archaeology Officer. No further construction shall proceed until the requirements for 36 CFR 800 have been satisfied.
- b. If human remains or ceremonial objects are discovered either during archaeological excavation or during construction, the project will stop immediately and procedures described in the Vermont Statutes including 13 V.S.A. § 3761, Unauthorized Removal of

Human Remains, and 18 V.S.A. § 5212b, Unmarked Burial Sites Special Fund and reporting of Unmarked Burial Sites shall be followed. Coordination between VTrans and the VT SHPO shall follow the Advisory Council's Policy Statement on Treatment of Human Remains and Grave Goods, (1998). All excavation in the vicinity will cease immediately. Remains shall be left in place and protected and will follow the procedure below:

"When an unmarked burial site is first discovered, the discovery shall be reported immediately to a law enforcement agency. If, after completion of an investigation pursuant to section 5205 of this title, a law enforcement agency determines that the burial site does not constitute evidence of a crime, the law enforcement agency shall immediately notify the state archaeologist who may authorize the appropriate action regarding the unmarked burial site (18 V.S.A. § 5212b(f))"

- c. If the human remains are identified as Native American, then a treatment and reburial plan shall be developed in full consultation with the appropriate Native American group(s) in compliance with the requirements of NAGPRA.

New Hampshire: In the event of discovery of a previously unidentified site or human remains in New Hampshire during project construction, the following stipulations for the New Hampshire side shall be followed:

- a. If human remains are discovered during project construction, that portion of the project will stop immediately. The resident engineer shall notify the county medical examiner and the state archaeologist at NH Department of Historical Resources (NHDHR) as per RSA 227-C:8-a-II, as well as the NHDOT Cultural Resources Program Specialist/Archaeologist or Cultural Resources Program Manager so that the proper steps may be taken by these agencies to determine proper procedures and identify the appropriate notification process. Cover and protect the burial. Construction activities shall not continue until verbal notification is provided by the NHDOT. If the human remains are determined by the medical examiner to be subject to the provisions of RSA 227-C:8-b then FHWA with NHDOT and NHDHR shall be responsible for complying with RSA 227-C:8 and NAGPRA, not the investigating archaeologist.
- b. When the burial is Native American, whether or not the group is federally recognized, RSA 227-C:8-d directs the State Archaeologist to immediately notify the leaders, officials, or spokesperson of Native American tribes or groups to determine the appropriate treatment of the burial (see also RSA 227-C:8-g). In addition, a treatment and reburial plan shall be developed in full consultation with the appropriate Native American group(s) in compliance with the requirements of NAGPRA.
- c. When the burial is not Native American, the State Archaeologist and often the NHDOT Bureau of Right of Way seek identification of descendants to determine wishes for disposition of the burial (see also RSA 227-C:8-e and 8-g). If skeletal analysis is deemed appropriate, this study shall be undertaken by a qualified analyst in consultation with the NHDHR and NHDOT (see RSA 227-C:8-f).

- d. If unanticipated archaeological features and artifacts are discovered, that portion of the project shall stop immediately. The resident engineer shall notify the NHDOT Cultural Resources Program Specialist/Archaeologist or Cultural Resources Program Manager and the State Archaeologist at the NHDHR so that the proper steps may be taken by these agencies to determine proper procedures. Regulation 36 CFR 800.13 (b) states that if historic properties are located after the conclusion of the Section 106 process as “post review discoveries,” for example those arising during construction, the federal agency official shall make every reasonable effort to avoid, minimize, or mitigate the effect of the project on the properties. In such situations in which the NHDOT must recover archaeological remains in a short time period and they do not involve human remains, the identified features and artifact concentrations shall be recovered following the guideline for Phase III excavations as closely as possible. Construction monitoring of the affected area may follow this recovery if the type of archaeological deposit, landscape, vegetation, and project allow this approach to be effective.

VI. MONITORING AND REPORTING

Each year following the execution of this MOA until it expires, is terminated, or completed NHDOT shall provide all parties to this MOA a summary report detailing work undertaken pursuant to its terms. Such report shall also include any scheduling changes proposed, any problems encountered, and any disputes and objections received in FHWA's efforts to carry out the terms of this MOA.

VII. DISPUTE RESOLUTION

Should any signatory or concurring party to this MOA object at any time to any actions proposed or the manner in which the terms of this MOA are implemented, FHWA shall consult with such party to resolve the objection. If FHWA determines that such objection cannot be resolved, FHWA will:

A. Forward all documentation relevant to the dispute, including FHWA's proposed resolution, to the ACHP. The ACHP shall provide FHWA with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, FHWA shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, signatories and concurring parties, and provide them with a copy of this written response. FHWA will then proceed according to its final decision.

B. If the ACHP does not provide its advice regarding the dispute within the thirty (30) day time period, FHWA may make a final decision on the dispute and proceed

accordingly. Prior to reaching such a final decision, FHWA shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories and concurring parties to the MOA, and provide them and the ACHP with a copy of such written response.

C. FHWA's responsibility to carry out all other actions subject to the terms of this MOA that are not the subject of the dispute remain unchanged.

VIII. AMENDMENTS

This MOA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP.

IX. TERMINATION

If any signatory to this MOA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment per Stipulation VIII, above. If within thirty (30) days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the MOA upon written notification to the other signatories.

Once the MOA is terminated, and prior to work continuing on the undertaking, FHWA must either (a) execute an MOA pursuant to 36 CFR § 800.6 or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. FHWA shall notify the signatories as to the course of action it will pursue.

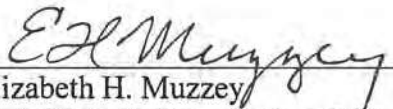
Execution of this MOA by the FHWA, NHDOT, VTrans and NH SHPO and implementation of its terms evidence that FHWA has taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.

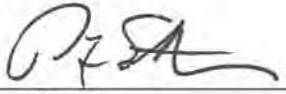
Lancaster, NH – Guildhall, VT
A001(159)
16155

SIGNATORIES:

STATE OF NEW HAMPSHIRE:


for Patrick Bauer, Administrator 05/24/2017
Federal Highway Administration Date


Elizabeth H. Muzzey 5/18/17
State Historic Preservation Officer Date
NH Division of Historical Resources

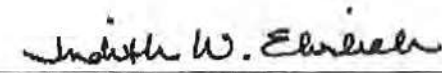

Peter E. Stamnas 5/22/17
Director of Project Development Date
NH Department of Transportation

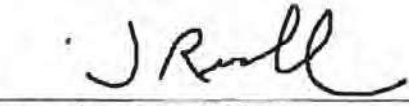
Lancaster, NH – Guildhall, VT
A001(159)
16155

SIGNATORIES:

STATE OF VERMONT:


Matthew Hake, Division Administrator 23 May 17
Federal Highway Administration Date


Judith Williams Ehrlich 5/9/2017
VTrans Historic Preservation Officer Date
VT Agency of Transportation


Jeannine Russell-Pinkham 5/23/2017
VTrans Archaeology Officer Date
VT Agency of Transportation

State of Vermont
Division for Historic Preservation
Deane C. Davis Building, 6th Floor
One National Life Drive, Montpelier, VT 05620-0501
www.accd.vermont.gov/historic-preservation

[phone] 802-828-3540

*Agency of Commerce and
Community Development*

August 23, 2017

Mr. Patrick Bauer
FHWA-New Hampshire Division Administrator
James C. Cleveland Federal Building
53 Pleasant Street, Suite 2200
Concord, NH 03301

Ms. Elizabeth H. Muzzey
New Hampshire State Historic Preservation Officer
19 Pillsbury Street, 2nd floor
Concord, NH 03301-3570

Mr. Peter Stamnas
New Hampshire Department of Transportation
John O. Morton Building
PO Box 483 / 7 Hazen Drive
Concord, NH 03302-0483

Mr. Matthew Hake
FHWA-Vermont Division Administrator
87 State Street, Suite 216
Montpelier, VT 05602

Ms. Judith Ehrlich, Historic Preservation Officer
Ms. Jeannine Russell-Pinkham, Archaeology Officer
Vermont Agency of Transportation
1 National Life Drive, Davis Building, 3rd Floor
Montpelier, VT 05633-5001

Re: Memorandum of Agreement between the Federal Highway Administration, the New Hampshire Department of Transportation, the Vermont Agency of Transportation, and the New Hampshire State Historic Preservation regarding the US Route 2 Bridge Replacement Between Lancaster, New Hampshire and Guildhall, Vermont

Dear Mr. Bauer, Ms. Muzzey, Mr. Stamnas, Mr. Hake, Ms. Ehrlich, and Ms. Russell-Pinkham,

The Vermont Division for Historic Preservation (VDHP) has reviewed the above-referenced Memorandum of Agreement (MOA). According to the terms of paragraph 4(G)(2) of the Programmatic Agreement among the Federal Highway Administration, the Vermont Agency of Transportation, the Advisory Council on Historic Preservation, and the Vermont State Historic Preservation Officer regarding implementation of the Federal-



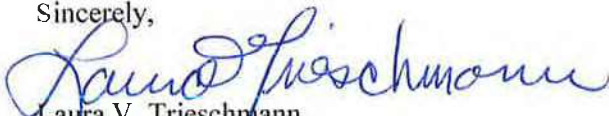
Aid Highway Program in Vermont, dated April 5, 2000 (PA), the Vermont State Historic Preservation Officer's signature is required on any Memorandum of Agreement regarding special provisions adopted to avoid, minimize, or mitigate adverse effects.

Recognizing that the MOA has already been executed, VDHP hereby retroactively approves of this MOA, as if we had signed the original. Please note that VDHP should be consulted prior to any amendment of the MOA and notified of progress as set forth in paragraph VI of the MOA.

Also, please note that VDHP is required to review the draft Archaeological Data Recovery Plan, including a detailed draft scope of work before it is finalized, in accord with Vermont Standard Mitigation Measure 15, which reads: The VTrans Archaeology Officer shall provide a draft Archaeological Data Recovery Plan, including a detailed draft scope of work, to the SHPO prior to finalizing the Data Recovery Plan and offer the SHPO an opportunity to comment on it within 30 days.

Thank you all for your attention to these matters, and for your assistance in protecting Vermont's and New Hampshire's irreplaceable historic resources.

Sincerely,


 Laura V. Trieschmann
 Vermont State Historic Preservation Officer

cc: Katie Buckley, Commissioner of Housing and Community Development, ACCD
 Andrea Wright, Environmental Services Manager, VTrans
 Kenneth R. Sikora, Environmental Program Manager, FHWA-VT Division
 MaryAnn Naber, FHWA Liaison, Advisory Council on Historic Preservation
 John Vetter, chair, Vermont Advisory Council on Historic Preservation

Attachments: Memorandum of Agreement between the Federal Highway Administration, the New Hampshire Department of Transportation, the Vermont Agency of Transportation, and the New Hampshire State Historic Preservation regarding the US Route 2 Bridge Replacement Between Lancaster, New Hampshire and Guildhall, Vermont





**US Army Corps
of Engineers**[®]
New England District

**New Hampshire General Permits (GPs)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)**

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to “work” include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See GC 5, regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*	X	
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	X	
2.2 Are there proposed impacts to SAS, special wetlands. Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) DataCheck Tool for information about resources located on the property at https://www2.des.state.nh.us/nhb_datacheck/ . The book Natural Community Systems of New Hampshire also contains specific information about the natural communities found in NH.		X
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	X	
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)	X	
2.5 The overall project site is more than 40 acres?		X
2.6 What is the area of the previously filled wetlands?	390 sf	
2.7 What is the area of the proposed fill in wetlands?	1,348 sf	
2.8 What is the % of previously and proposed fill in wetlands to the overall project site?	0.14%, 0.50%	
3. Wildlife	Yes	No
3.1 Has the NHB & USFWS determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require an NHB ID number & a USFWS IPAC determination.) NHB DataCheck Tool: https://www2.des.state.nh.us/nhb_datacheck/ USFWS IPAC website: https://ecos.fws.gov/ipac/location/index	X	

3.2 Would work occur in any area identified as either “Highest Ranked Habitat in N.H.” or “Highest Ranked Habitat in Ecological Region”? (These areas are colored magenta and green, respectively, on NH Fish and Game’s map, “2010 Highest Ranked Wildlife Habitat by Ecological Condition.”) Map information can be found at: • PDF: www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm . • Data Mapper: www.granit.unh.edu . • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html .	X	
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		X
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		X
3.5 Are stream crossings designed in accordance with the GC 21?	X	
4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?	X	
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?		X
5. Historic/Archaeological Resources		
For a minimum, minor or major impact project - a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) with your DES file number shall be sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document**	X	

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.

** If your project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.

Army Corps of Engineers Secondary Impacts Checklist Supplemental Narrative

1. Impaired Waters

1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water?

Yes. The 2016 303(d) List of Threatened or Impaired Waters That Require a TMDL was reviewed for impairments within the project area. The Connecticut River within one mile of the project area has water impairments for aluminum, *Escherichia coli*, and pH, as listed in Table 2. Aluminum and pH are identified as "Development Impairments" by NHDOT.

Table 3 - Impairments within 1-mile of project area

Assessment Unit ID	Designated Use	Impairment Class	Impairment	Source
NHRIV801010902-02	Primary Contact Recreation	4A - M	<i>Escherichia coli</i>	unknown
NHRIV801010903-03	Aquatic Life	5-M	pH	unknown
		5-M	Aluminum	unknown

4A = Impaired, TMDL Completed

5 = Impaired / TMDL Needed

M = Marginal Impairment

The US Route 2 Bridge Replacement project is within the Connecticut River Designated Corridor and will have greater than 50,000 square feet of disturbance. Therefore, the project is required to meet the New Hampshire Department of Environmental Services (NHDES) Alteration of Terrain (AOT) Rules under the Memorandum of Agreement (AOT MOA) between the New Hampshire Department of Transportation and NHDES. This project will increase the impervious surface area by approximately 6,100 square feet due to increased roadway and bridge shoulder widths and realignment of the VT Route 102 and US Route 2 intersection. In accordance with the AOT MOA, this project will need to capture and treat a minimum of two times the increased impervious surface area, or at least 12,200 square feet. Several options have been considered for stormwater treatment, with treatment swales being the recommended method of treatment. A 162' long, 4' wide swale is proposed within the existing Vermont bridge approach fill material. A 216' long, 4' wide swale is proposed within the existing New Hampshire bridge approach fill material. These lengths and widths were required to achieve hydraulic residence times that would meet NHDES AOT regulations. Deep sump catch basins are proposed to provide pretreatment for the swales.

2. Wetlands

2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?

Yes. The project area is located over and within the Connecticut River.

2.4 Would the project remove part or all of a riparian buffer?

Yes. There will be a minor amount of tree clearing totaling approximately 2,000 square feet to facilitate construction of the new bridge.

3. Wildlife

3.1 Has the NHB determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require a NHB determination.)

New Hampshire-Listed Species

A datacheck with the NHNHBB dated May 2, 2017 identified the state and federally endangered dwarf wedgemussel and the Special Concern Species riverine clubtail (*Stylurus amnicola*) as occurring near the project area (Exhibit E – NHB17-1277). The New Hampshire Fish and Game (NHF&G) non-game program was contacted for guidance on the rare animal species occurrences. NHF&G had no concerns about the riverine clubtail, and is aware that Section 7 Consultation for dwarf wedgemussels has been undertaken with the US Fish and Wildlife Service New England Field Office (USFWS) (Exhibit F – NHF&G Correspondence).

Federally-Listed Species

An inquiry was made through the USFWS Information for Planning and Conservation website (IPaC) that indicated that the northern long-eared bat (*Myotis septentrionalis*), the dwarf wedgemussel and Canada lynx (*Lynx canadensis*) have the potential to occur within the project area (Exhibit G – IPaC Consultation Response). Section 7 consultation with the USFWS New England Field Office was undertaken and a Biological Opinion (BO) was issued by the USFWS on March 31, 2017 (Exhibit I – Section 7 Biological Opinion). The BO included a determination that incidental take of the dwarf wedgemussels is likely to occur and included a number of reasonable and prudent measures and terms and conditions that must be followed. These include:

- A pre-construction mussel survey and relocation in August or September the year before construction starts.
- A prohibition on in-water work from April 1 to May 15, when spring spawning of dwarf wedgemussels is likely to be at its peak.
- Best Management Practices for construction to avoid, minimize and mitigate impacts to dwarf wedgemussels.
- A requirement that if more than 25 mussels are found during the first preconstruction survey, a second survey and relocation must occur before the second year of construction.
- Requirements for monitoring and reporting following the mussel relocation operation.

The BO also included determinations that Canada Lynx would not be affected by the proposed project. Vegetation removal may affect the Northern Long-Eared Bat, however any

resulting incidental take is not prohibited by the final 4(d) rule.

3.2. Would work occur in any area identified as either “Highest Ranked Habitat in N.H.” or “Highest Ranked Habitat in Ecological Region”?

Yes. The 2015 Wildlife Action Plan was consulted and the upland areas surrounding the bridge are identified as Highest Ranked Habitat in New Hampshire (Exhibit M – 2015 Wildlife Action Plan)

3.5 Are stream crossings designed in accordance with the PGP, GC 21?

Yes. Bank stabilization structures will be designed to minimize environmental effects.¹

4. Flooding/Floodplain Values

4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?

The proposed project is in a special flood hazard area (Zone A6) and is being constructed within a regulatory floodplain based on a review of the National Flood Insurance Program FIRM maps. The proposed new pier will be constructed within the regulatory floodway of the Connecticut River and the existing pier will be removed. (Exhibit D-1, FEMA Floodplain) A hydraulic study was undertaken for the project that demonstrated that there would be no increase in base flood elevations for the 100-year flood (Q-100 flood) with the construction of the proposed bridge. The hydraulic study shows a slight decrease in base flood elevations of between 0.1 feet and 0.5 feet, at the proposed bridge crossing and to approximately 350 feet upstream and 50 feet downstream of the bridge, as a result of improved hydraulic opening geometry and characteristics associated with the proposed construction (Exhibit D-2 - Hydraulic Analysis Letter Report).

4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?

No compensatory flood storage is proposed. The project as proposed will result in a loss of 4,150 cubic yards of flood storage below elevation 853.2, which is the 100 year FEMA FIS volume. However, the hydraulic analysis study undertaken for the project demonstrated that the proposed project will not increase flood levels within the communities of Lancaster, NH and Guildhall, VT.

¹ Condition 21 of the 2013 PGP required that “(c) All temporary and permanent crossings of rivers, streams, brooks, etc. (here on referred to as “streams”) shall conform to the ‘New Hampshire Stream Crossing Guidelines, May 2009.’” Under the 2017 PGP this requirement is under Condition 22. As documented in the Alternative Design Report of this application the proposed rehabilitation will not bring the bridge into compliance with all requirements of the New Hampshire Stream Crossing Guidelines, so Condition 22 will not be met.

5. Historic/Archaeological Resources

For a minor or major impact project - a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) shall be sent to the NH Division of Historical Resources as required on Page 5 of the PGP.

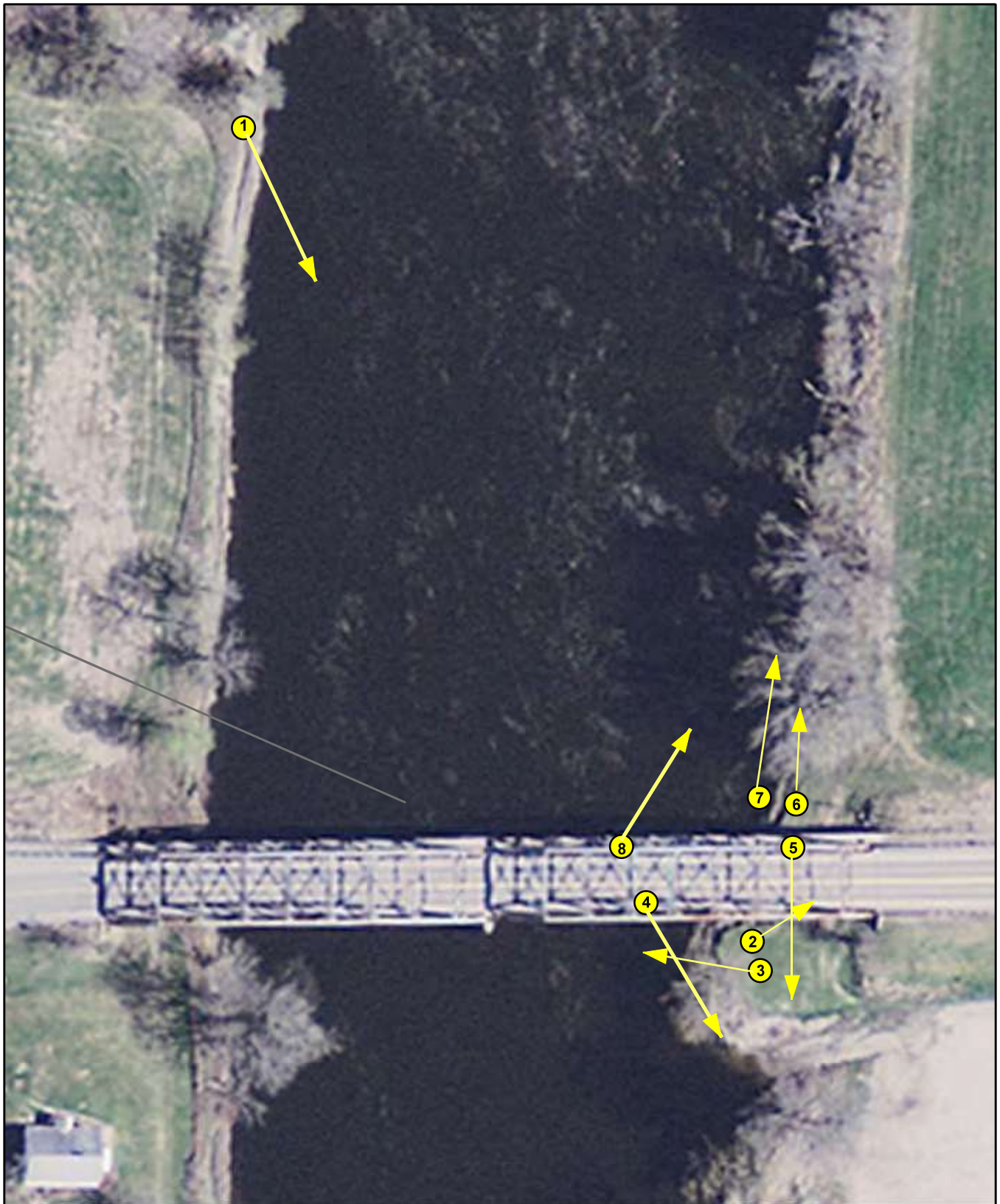
Section 106 of the National Historic Preservation Act of 1966 requires federal agencies to take into account the effects of their undertakings on historic properties. Federal agencies consult with the State Historic Preservation Officer (SHPO), which in New Hampshire is housed within the NH Division of Historical Resources (NHDHR), and within VTrans in Vermont for VTrans projects. NHDOT has coordinated with both SHPOs and the Federal Highway Administration (FHWA) to locate and identify properties listed in or eligible for listing in the National Register of Historic Places (National Register) within the project area.

Rogers' Rangers Bridge (existing US Route 2 bridge) is comprised of two (2) High Parker Through Steel Trusses with a central pier. The bridge was erected in 1950, and features an attached pedestrian footbridge, added in 1996, along the north side which also accommodates snowmobiles crossing. Rogers' Rangers Bridge (US Route 2 bridge) was determined to be eligible for the National Register under criterion A as it marks a crossing in existence since 1790, its association with Rogers' Rangers, and is locally significant to transportation and community development; and under criterion C for engineering due to its unique design. Existing structures located within the project corridor in both New Hampshire and Vermont were evaluated for historic significance and reviewed by the respective NH and VT SHPOs. No other structures were found to be historically significant.

A Phase IA/IB archaeological survey was completed within the project's area of potential effect (APE). Archaeological sites were identified in both the northeast and northwest quadrants of the bridge. The archaeological site VT-ES-0064 (Sandy Knoll Site), located in the northwest quadrant of the existing bridge, was identified as eligible for the National Register. A Phase II Evaluation Study was conducted in June and July 2015. The VTrans Archaeological Officer recommended that further Phase II, and some Phase III, work be carried out in the areas of existing features and areas further west that had not been investigated beyond the Phase I. Further investigations will be completed prior to construction using an Archaeological Consultant on retainer with VTrans.

Applying the criteria of effect at 36 CFR 800.5, it was determined that the Proposed Action (bridge replacement) will have an adverse effect on the bridge and on the archaeological site VT-ES-0064. An Adverse Effect Memo was executed on January 27, 2017 detailing the effects to historic resources (Exhibit J – Section 106 Adverse Effect Memorandum). Mitigation measures are detailed in the Memorandum of Agreement (MOA) among the Federal Highway Administration (NH and VT Divisions), the New Hampshire Department of Transportation, the Vermont Agency of Transportation, the VTrans Historic Preservation Officer and the New Hampshire State Historic Preservation Officer dated May 24, 2017 (Exhibit K - Section 106 MOA). The Vermont State Historic Preservation Officer (VTSHPO)

has reviewed the executed MOA and retroactively approved it, as if they had signed the original (Exhibit L – VTSHPO Letter on the MOA). The VTSHPO further noted that the Vermont Division of Historic Preservation (VDHP) is to be consulted prior to any amendment of the MOA, notified of progress on the execution of the MOA, as outlined in the Paragraph VI of MOA, and is to review the draft Archaeological Data Recovery Plan. Mitigation measures for the bridge include archival documentation of the bridge, interpretive signage, marketing of the bridge for reuse, and review of the design plans by signatories to the MOA. Mitigation measures for impacts to archaeological resources in Vermont include additional archaeological surveys of the Sandy Knoll Site (VT-ES-0064), and at the southwest quadrant of the bridge if impacted by construction access, and the development of a public education component.



0 35 70 140 Feet



NHDOT
LANCASTER NH & GHUILDHALL, VT
LANCASTER-GUILDHALL 16155

EXHIBIT M - PHOTOGRAPHS

SCALE: 1:880

NORMANDEAU
environmental consultants
25 Nashua Road Bedford, NH 03110
(603) 472-5191 www.normandeau.com

JANUARY 2018

Date : 1/11/2018
Drawn By: volase
Project No: 22286.010



Photo 1. US Rte 2 bridge, view southwest. (8/2/2012)



Photo 2. Connecticut River, NH abutment, view northeast (8/2/2012)



Photo 3. Bridge pier, view west (8/2/2012)



Photo 4. Southeast riverbank (10/23/2012)



Photo 5 River bank from under bridge - view south (8/23/2012)



Photo 6. Riverbank - view north (8/23/2012)



Photo 7 Riverbank, view north under bridge



Photo 8. Northeastern Riverbank (10/23/2012)

Pier Construction Sequence

1. Construct access to the pier site with construction barges and/or a temporary trestle.
2. Construct a four sided steel sheeted cofferdam with internal bracing.
3. Excavate in-the-wet within the cofferdam, to the design bottom of concrete seal elevation. Excavated materials will be deposited into spoil containment equipment on the barge or trestle. Spoil containment equipment on the temporary trestle and/or barge may consist of trucks for hauling the material off for proper treatment and disposal, or other containment measures on the barges and/or trestles, which would include weirs to allow sedimentation of solids and control of water. The concrete seal elevation and spoil containment equipment shall be determined by the contractor based on their construction means and methods. The bottom of concrete seal elevation can be expected to be about four to five feet below the existing riverbed elevation.
4. Install permanent steel casings, drill shafts into the bedrock, and install reinforcement cages, and pour concrete for the pier drilled shafts. Spoils from this process will be deposited over land in accordance with best management practices.
5. Dewater the cofferdam by pumping into containment, cut and remove the permanent steel casing to the top of concrete seal/bottom of footing elevation. The treated water will be pumped into the river.
6. Construct the pier footing and stem wall in-the-dry.
7. Remove steel sheeting cofferdam.

Construction barges and/or a temporary trestle will remain in place for approximately 24 months, until the new steel girders are erected and they are no longer required by the contractor's means and methods to complete the superstructure construction.

Existing Bridge Removal

1. Construct access to the existing bridge and pier site with construction barges and/or a temporary trestle.
2. Install temporary shoring towers, within the river, to support the existing bridge during removal operations. Although the contractor will determine the exact number of shoring towers needed, FHWA expects this to result in approximately 4,300 square feet of temporary impacts.
3. Mobilize the existing bridge removal equipment on construction barges and/or a temporary trestle.
4. Remove the existing bridge deck, flooring system and trusses using cranes and other equipment. No elements of the existing bridge will be allowed to fall into the river during removal operations. Removal sections will be set on the barges, the temporary trestle and/or land to complete demolition and disposal operations.
5. Mobilize the pier removal equipment on construction barges and/or a temporary trestle.

6. Install a four sided water diversion structure, such as a sand-bag cofferdam, to divert flow around the existing Pier. The contained area will not be pumped dry.
7. Demolish the existing pier in-the-wet to the mud line and remove the pier debris from within the water diversion structure onto the barge or trestle to be hauled off for proper disposal.
8. Remove access to the existing Pier site with construction barges and/or a temporary trestle.

Construction of the new bridge and removal of the existing bridge is estimated to take 24 months total and will last for two construction seasons. There will be some removal of vegetation along the shoreline of the river. Vegetation removal will be limited to what is necessary for construction access. Staging areas for construction equipment and materials will be set back from the riverbed. All areas will be contained with approved erosion and sediment control measures.

Env-Wt 404.04 Rip-rap.

Rip-rap applications shall be considered only where the applicant demonstrates that anticipated turbulence, flows, restricted space, or similar factors render vegetative and diversion methods physically impractical.

(b) Applications for rip-rap shall include:

(1) *Designation of a minimum and maximum stone size;*

The riprap will be Class C stone fill, minimum size $\frac{3}{4}$ ", maximum size 12"

(2) *Gradation;*

Sieve Size	Percentage by Weight Passing
12 in.	100
4 in.	50 - 90
1-1/2 in.	0 - 30
3/4 in.	0 - 10

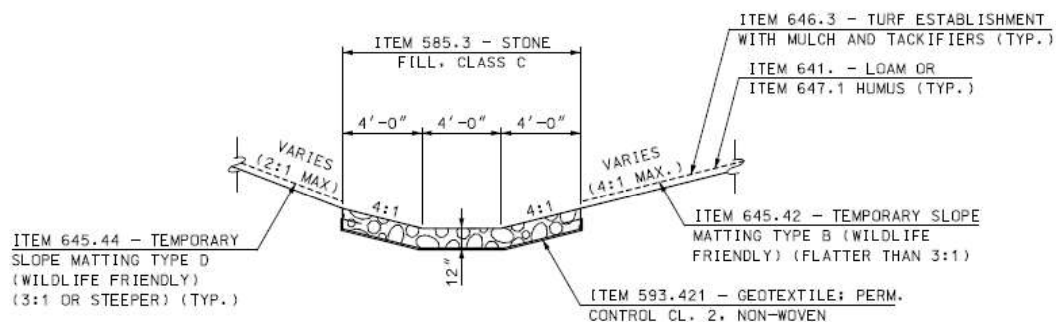
(3) *Minimum rip-rap thickness;*

12"

(4) *Type of bedding for stone;*

Stone will be placed on native ground with a layer of geotextile fabric.

(5) *Cross-section and plan views of the proposed installation;*



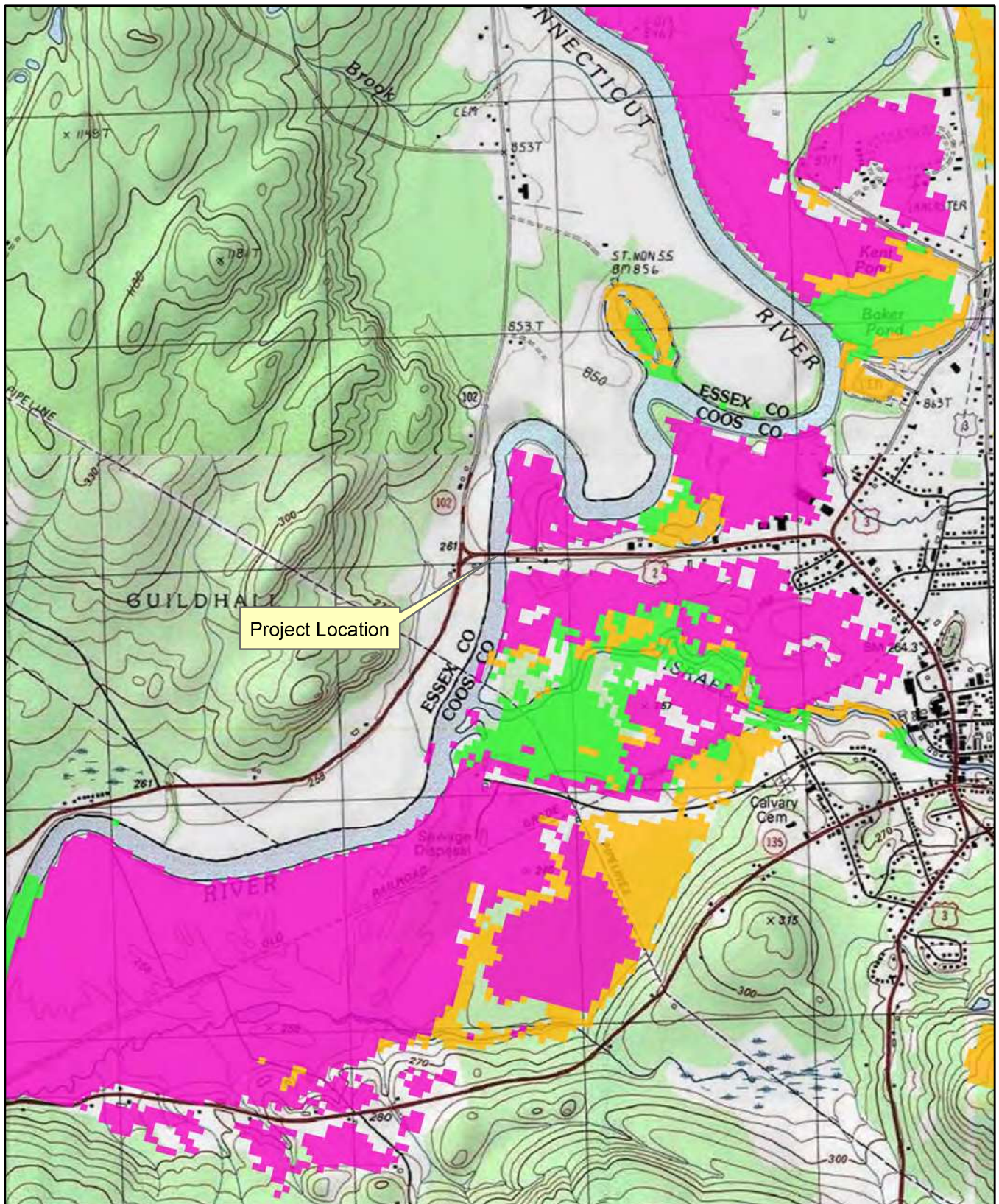
Cross Section view above. See Wetland Impact Plan Sheet 1 of 2 for plan view of stone swale installation.

(6) Sufficient plans to clearly indicate the relationship of the project to fixed points of reference, abutting properties, and features of the natural shoreline; and

See Wetland Impact Plan Sheet 1 of 2

(7) A description of anticipated turbulence, flows, restricted space, or similar factors that would render vegetative and diversion methods physically impractical.

The stone outlet protection on the bank and below Ordinary High Water in front of the existing New Hampshire abutment has been designed to protect the riverbank and river bed from erosion. There currently is no vegetation in that area and existing erosion exists. Due to the fluctuation of the river, and current lack of vegetation, stone protection is proposed. Additionally, the swale above this location requires stone due to flows and velocities (Exhibit N – Channel Lining Calculations).



Project Location

0 1,000 2,000 4,000 Feet

N

Legend

2015 Wildlife Action Plan Tiers

- Highest Ecological Value in State
- Highest Ecological Value in Region
- Supporting Landscapes

Date: 4/27/2017
 Drawn By: VChase
 Project No: 22286-010

NHDOT

LANCASTER NH & GUILDHALL, VT

LANCASTER-GUILDHALL 16155

EXHIBIT N - WILDLIFE ACTION PLAN

SCALE: 1:24,000

NORMANDEAU
 environmental consultants
 25 Nashua Road Bedford, NH 03110
 (603) 472-5191 www.normandeau.com

AUGUST 2017

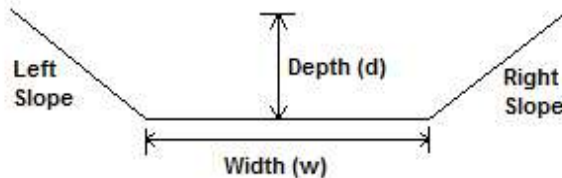
DRAIN NOTE NUMBER

N/App

CHANNEL STATIONING

STONE SWALE (STA. 410+20, RT TO 410+84, RT)

Stone Swale Design:



DESIGN INFORMATION

DEPTH OF CHANNEL: 2 **FT**
WIDTH OF CHANNEL: 4 **FT**
LEFT SIDE SLOPE: 4 **:1**
RIGHT SIDE SLOPE: 4 **:1**

SLOPE OF CHANNEL: 0.0392 **FT/FT**

LENGTH OF SWALE: 64 **FT**

Mannings (n): 0.035 (Manual, pg. 9-4, III.D.1 - Based on Design Section)

DESIGN STORM: 50 YEAR

MAXIMUM VELOCITY: 3.26 **FPS** (InRoads Drainage Structure Analyzer - See Sheet 3 of 3)

AVERAGEFLOW DEPTH: 0.3 **FT** (InRoads Drainage Structure Analyzer - See Sheet 3 of 3)

Channel extends from
treatment swale
toward the
Connecticut River.

CHANNEL PROTECTION REQUIREMENTS

Median Stone Diameter (D₅₀): 0.25 **FT** (Manual, pg. 4-18, Fig 4-7)

STONE SIZE: CLASS C

Flow

$$Q = CiA$$

C =	0.64	(63% Pave, 37% Flat(2%), Sandy, Lawn)	For i calculation:
i =	7.0	(Drainage Manual, Fig 2-5)	Tc = 5 min
A =	48206	SF	Coos County
=	1.1067	Acres	50 Year Storm

Q = 4.96 CFS Area includes treatment swale area

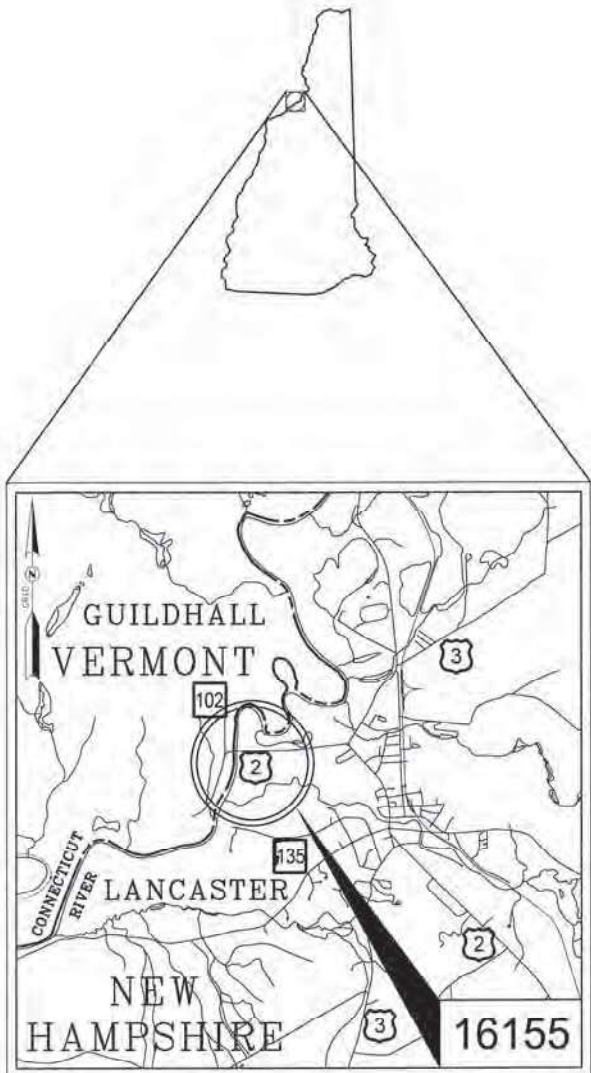
Manual - NHDOT Drainage Manual, April 1998

D₅₀ and stone size from Figure 4-7 of the New Hampshire Manual on Drainage Design for Highways, April 1998

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
WETLANDS PLANS
FEDERAL AID PROJECT



A001(159)
N.H. PROJECT NO. 16155
US ROUTE 2 OVER THE CONNECTICUT RIVER



LOCATION MAP
GRAPHIC SCALE
1 1/2 0 1 2 mi.

INDEX OF SHEETS

- 1 FRONT SHEET
- 2-3 STANDARD SYMBOLS SHEETS
- 4 BRIDGE SITE PLAN
- 5 ROADWAY PROFILE AND APPROACH SECTION
- 6 EROSION CONTROL STRATEGIES AND STABILIZATION MATRIX
- 7-8 WETLAND IMPACT PLANS
- 9-10 EROSION CONTROL PLANS
- 11 TRAFFIC CONTROL SEQUENCING

TOWN OF LANCASTER

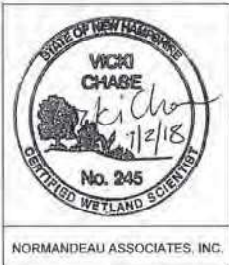
COUNTY OF COOS

SCALE: 1" = 150'

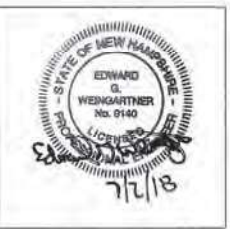
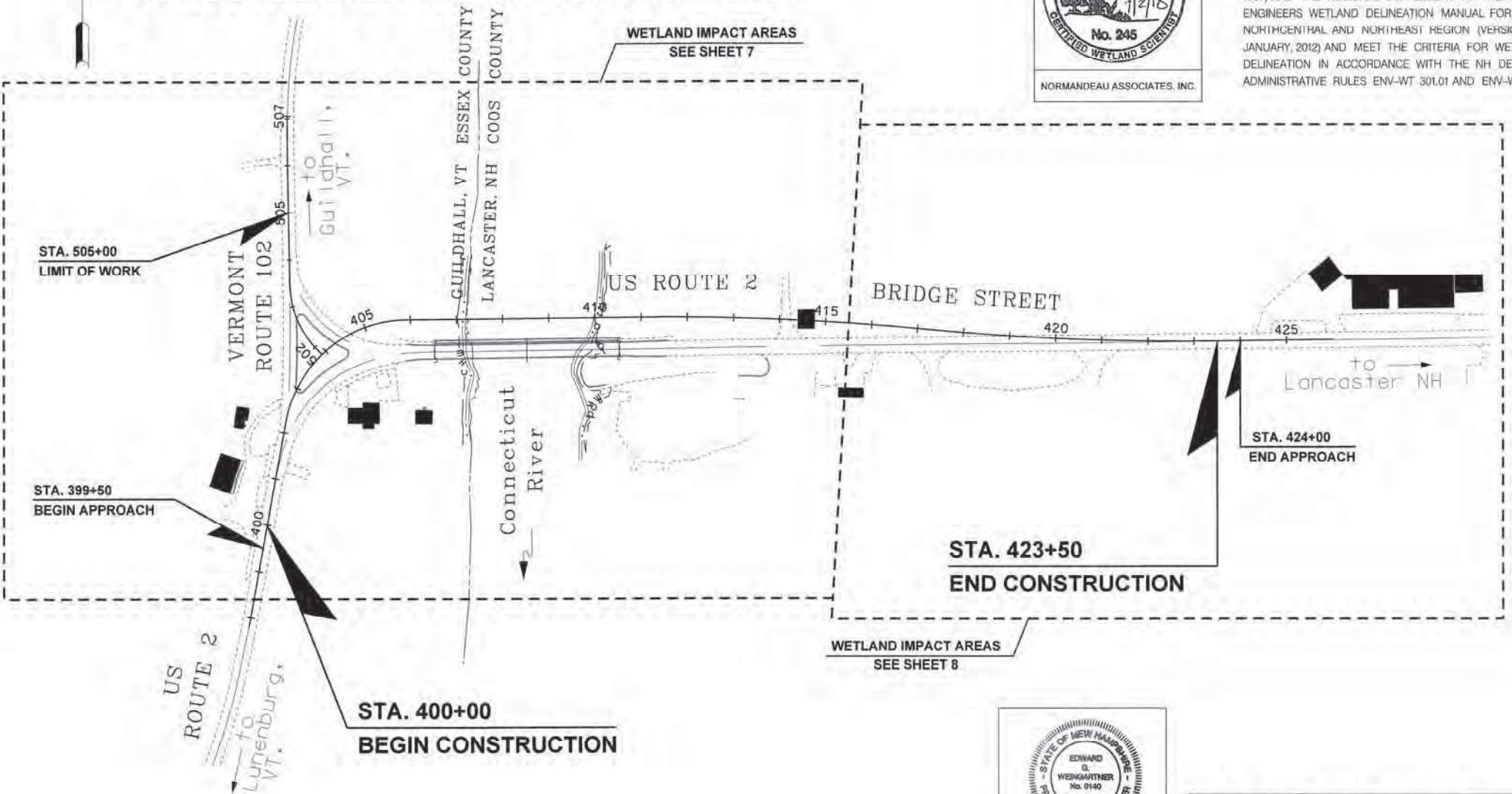
FOR CONSTRUCTION AND ALIGNMENTS DETAILS -
SEE CONSTRUCTION PLANS

DESIGN DATA

AVERAGE DAILY TRAFFIC 20 16	4100
AVERAGE DAILY TRAFFIC 20 36	5000
PERCENT OF TRUCKS	9.2%
DESIGN SPEED	30/45 MPH
LENGTH OF PROJECT	0.5 MI



WETLANDS WERE DELINEATED BY NORMANDEAU ASSOCIATES, INC. IN 2012 AND 2013. THE WETLAND DELINEATIONS WERE COMPLETED IN ACCORDANCE WITH THE CRITERIA DESCRIBED IN THE U.S. ARMY CORPS OF ENGINEERS WETLAND DELINEATION MANUAL TECHNICAL REPORT Y-87-1 (JANUARY, 1987) AND THE REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL FOR THE NORTH CENTRAL AND NORTHEAST REGION (VERSION 2.0, JANUARY, 2012) AND MEET THE CRITERIA FOR WETLAND DELINEATION IN ACCORDANCE WITH THE NH DES ADMINISTRATIVE RULES ENV-WT 301.01 AND ENV-WT 101.48.



Hoyle, Tanner & Associates, Inc.

NHDOT THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR APPROVAL:

DIRECTOR OF PROJECT DEVELOPMENT DATE

APPROVED:

ASSISTANT COMMISSIONER AND CHIEF ENGINEER DATE

HTA PROJECT NO.	MODEL	FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
092558.01	16155FSW	A001(159)	16155	1	11

SDR PROCESSED	NHDT	DATE	10/8/2014	REVISIONS AFTER PROPOSAL			
NEW DESIGN	JCC	DATE	5/2018	NUMBER	DATE	STATION	DESCRIPTION
SHEET CHECKED	AGB/TMC	DATE	5/2018				
AS BUILT DETAILS							

GENERAL	
EDGE OF PAVEMENT TRAVELED WAY	<div>PROPOSED ROADWAY</div> <div>existing roadway</div> <div>(pavement removed outside slope lines)</div>
DRIVEWAYS	<div>(label surface type)</div>
BUILDINGS	<div>(label house or type of building)</div> <div>(building to be removed)</div>
FOUNDATION	<div>(label type)</div>
LEACH FIELD	<div>leach field</div>
BRIDGE CROSSINGS	<div>STREAM</div> <div>OVERPASS</div>
STEPS AND WALK	<div>(label type)</div>
INTERMITTENT WATER COURSE	
SHORE LINE	<div>river/stream</div> <div>pond (label name of water body)</div>
POTENTIAL WET AREA SYMBOL	
BRUSH OR WOODS LINE	
TREES (PLANS)	<div>(deciduous)</div> <div>(coniferous)</div> <div>(stump)</div> <div>(show station, circumference in feet & type)</div>
TREE OR STUMP (CROSS-SECTIONS)	
HEDGE	<div>(label type)</div>
MONITORING WELL	<div>mon</div> <div>W</div>
WELL	<div>W</div>
FLAG POLE	<div>fp</div>
ORIGINAL GROUND (TYPICALS)	
ROCK OUTCROP	
ROCK LINE (TYPICALS & SECTIONS ONLY)	
GUARDRAIL (label type)	<div>existing</div> <div>bgr</div> <div>o gr</div> <div>PROPOSED</div>
JERSEY BARRIER	
CURB (LABEL TYPE)	
STONE WALL	
RETAINING WALL (LABEL TYPE)	<div>(points toward retained ground)</div>
FENCE (LABEL TYPE)	
SIGNS	<div>(single post)</div> <div>(double post)</div>
GAS PUMP	<div>gp</div>
FUEL TANK (ABOVE GROUND)	<div>ft (label size & type)</div>
STORAGE TANK FILLER CAP	<div>fc</div>
SEPTIC TANK	<div>S</div>
GRAVE	<div>gr</div>
MAILBOX	<div>mb</div>
VENT PIPE	<div>vp</div>
SATELLITE DISH ANTENNA	<div>da</div>
PHONE	<div>ph</div>
GROUND LIGHT/LAMP POST	<div>gl</div> <div>lp</div>
BORING LOCATION	<div>B</div>
TEST PIT	<div>TP</div>
INTERSTATE NUMBERED HIGHWAY	<div>293</div>
UNITED STATES NUMBERED HIGHWAY	<div>3</div>
STATE NUMBERED HIGHWAY	<div>102</div>

SHORELAND - WETLAND

WETLAND DESIGNATION AND TYPE

2

PUB2E

— D W —

— D W —

— D W —

DELINEATED WETLAND

ORDINARY HIGH WATER

TOP OF BANK

TOP OF BANK & ORDINARY HIGH WATER

NORMAL HIGH WATER

WIDTH AT BANK FULL

PRIME WETLAND

PRIME WETLAND 100' BUFFER

NON-JURISDICTIONAL DRAINAGE AREA

COWARDIN DISTINCTION LINE

TIDAL BUFFER ZONE

DEVELOPED TIDAL BUFFER ZONE

HIGHEST OBSERVABLE TIDE LINE

MEAN HIGH WATER

MEAN LOW WATER

VERNAL POOL

SPECIAL AQUATIC SITE

REFERENCE LINE

WATER FRONT BUFFER

NATURAL WOODLAND BUFFER

PROTECTED SHORELAND

INVASIVE SPECIES LABEL

INVASIVE SPECIES

— O H W —

— T O B —

— T O B O H W —

— N H W —

— W B F —

— P W E T —

— P W E T 100 —

— N J D A —

— C D L —

— T B Z —

— D T B Z —

— H O T L —

— M H W —

— M L W —

VP

— S A S —

— R E F —

— W B 50 —

— N W B 150 —

— P S 250 —

I.S.

I

I.S.

II

— I N V —

— I N V —

— I N V —

FLOODPLAIN / FLOODWAY

500 YEAR FLOODPLAIN BOUNDARY

100 YEAR FLOODPLAIN BOUNDARY

FLOODWAY

— F P 500 —

— F P 100 —

— F W —

ENGINEERING

CONSTRUCTION BASELINE

PC, PT, POT (ON CONST BASELINE)

PI (IN CONSTRUCTION BASELINES)

INTERSECTION OR EQUATION OF TWO LINES

ORIGINAL GROUND LINE (PROFILES AND CROSS-SECTIONS)

PROFILE GRADE LINE (PROFILES AND CROSS-SECTIONS)

CLEARING LINE

SLOPE LINE

SLOPE LINE (FILL)

SLOPE LINE (CUT)

PROFILES AND CROSS SECTIONS:

ORIGINAL GROUND ELEVATION (LEFT)

FINISHED GRADE ELEVATION (RIGHT)

30

31

32

⊙

△

⊕

—

—

SLOPE LINE

CLEARING LINE

—

—

72.5

79.14

SHEET 1 OF 2

REVISION DATE

11-21-2014

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

STANDARD SYMBOLS 1 OF 2

HTA PROJECT NO.

092558.01

MODEL

SYM01

DGN

161551SS

STATE PROJECT NO.

16155

SHEET NO.

2

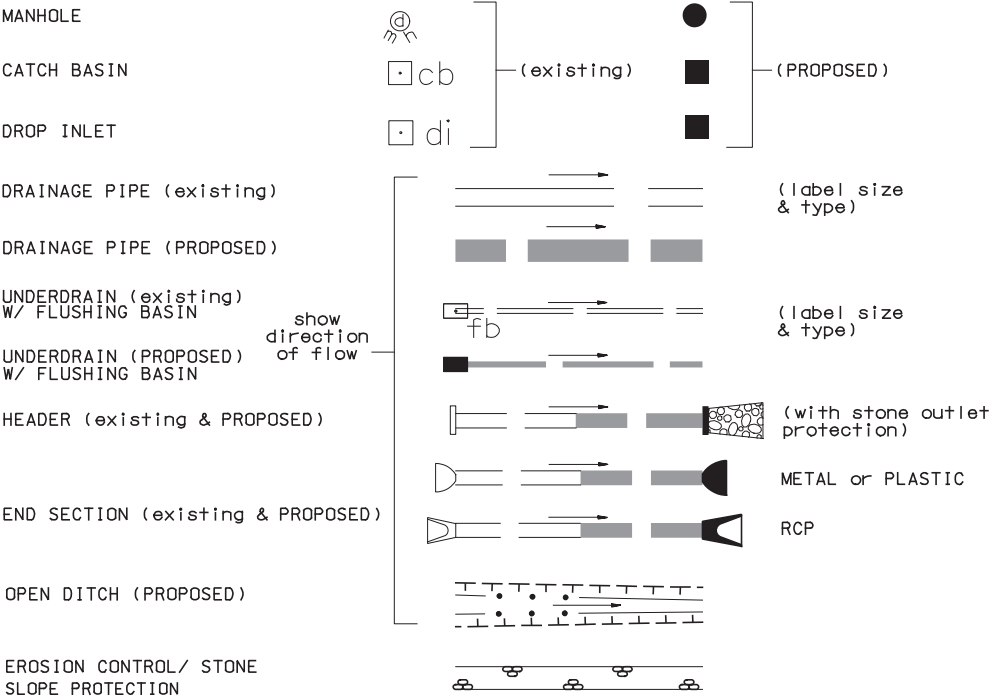
TOTAL SHEETS

11

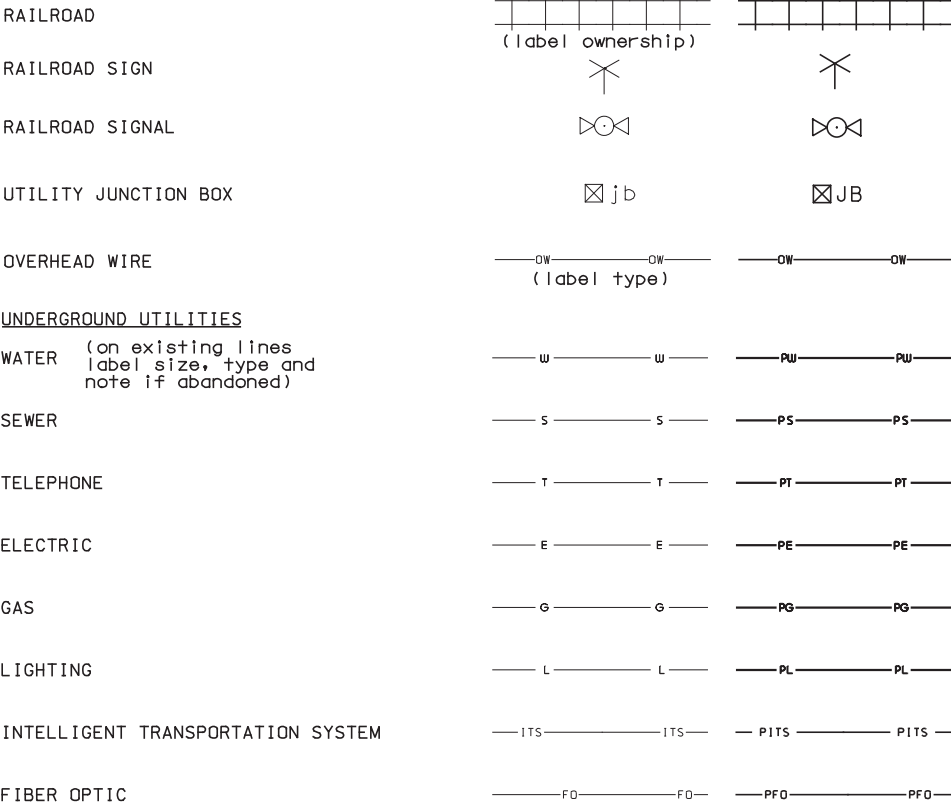
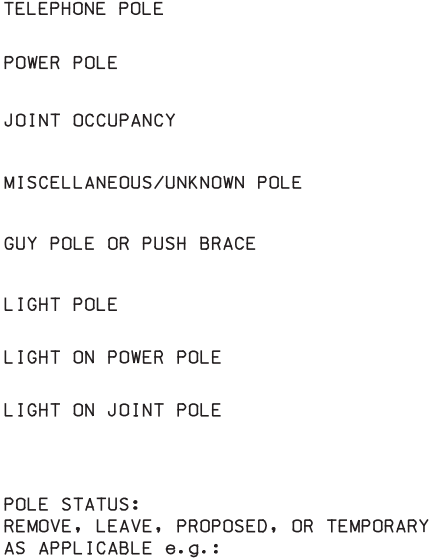
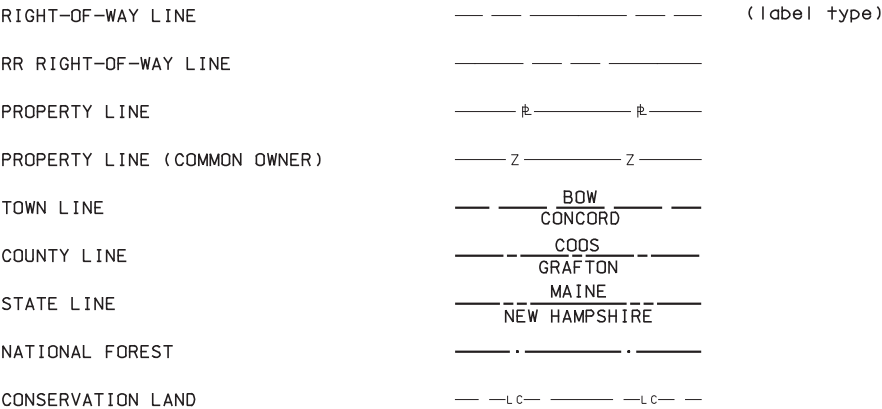
Hoyle, Tanner & Associates, Inc.

SDR PROCESSED		NHDOT		DATE		10/8/2014		AS BUILT DETAILS	
REVISIONS AFTER PROPOSAL		STATION		DATE		5/2018		DATE	
DESCRIPTION		STATION		DATE		5/2018		DATE	
NEW DESIGN		JCC		DATE		5/2018		DATE	
SHEET CHECKED		AGB/TMC		DATE		5/2018		DATE	

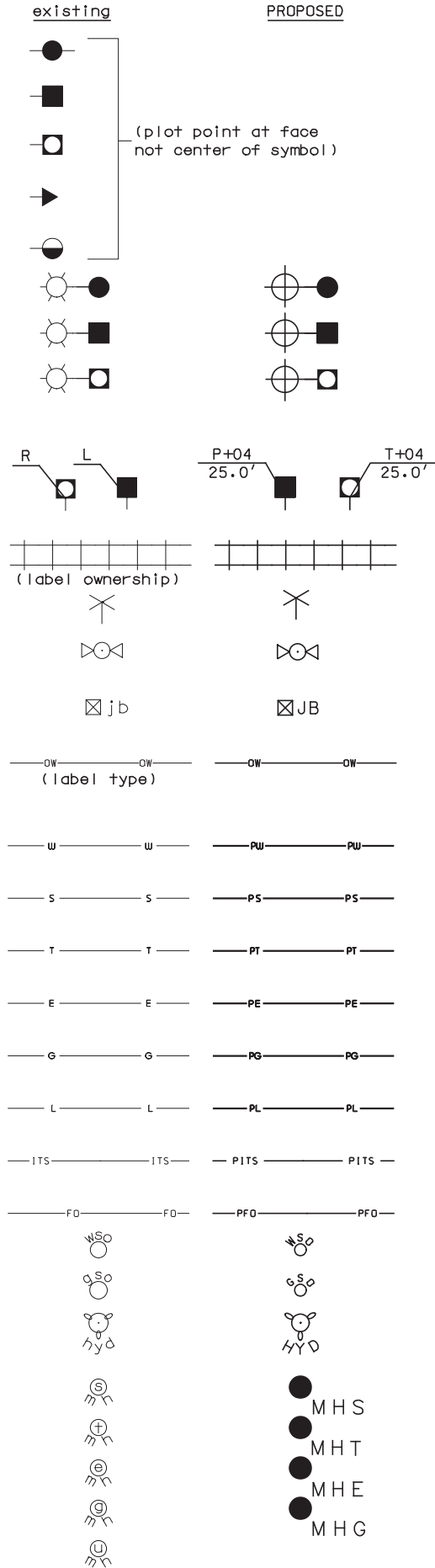
DRAINAGE



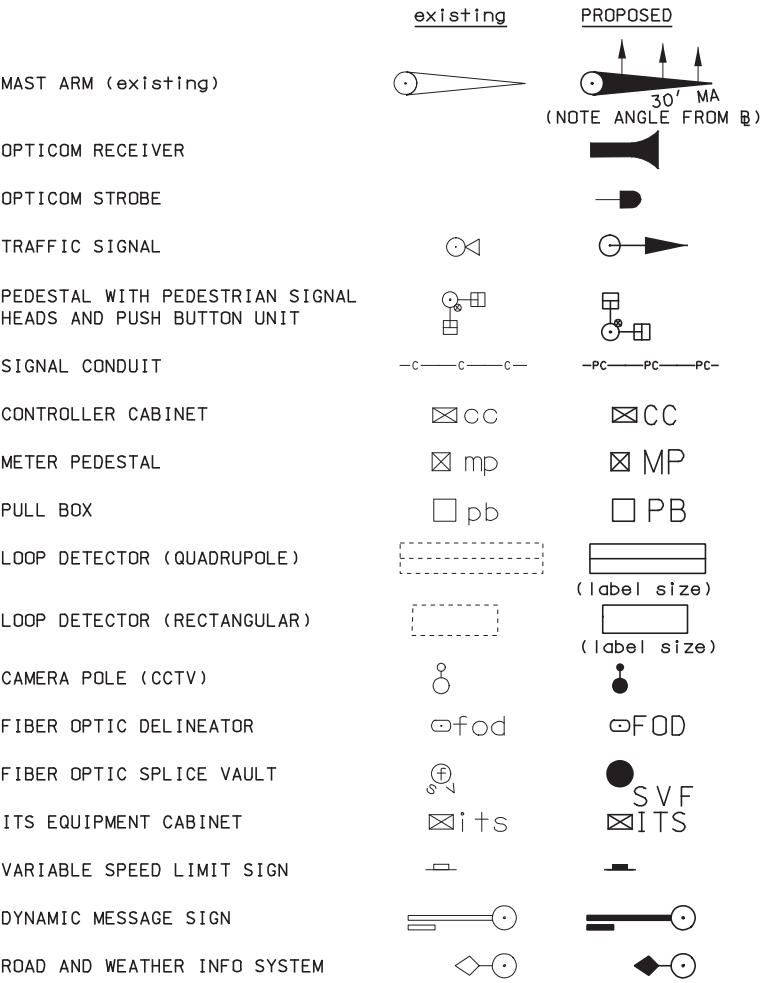
BOUNDARIES / RIGHT-OF-WAY



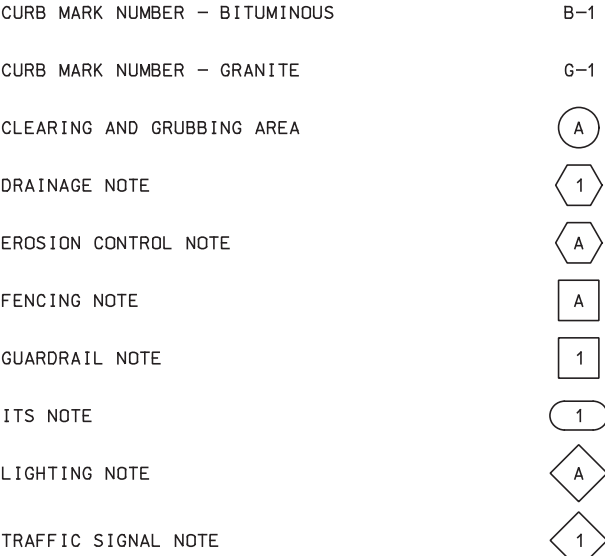
UTILITIES



TRAFFIC SIGNALS / ITS

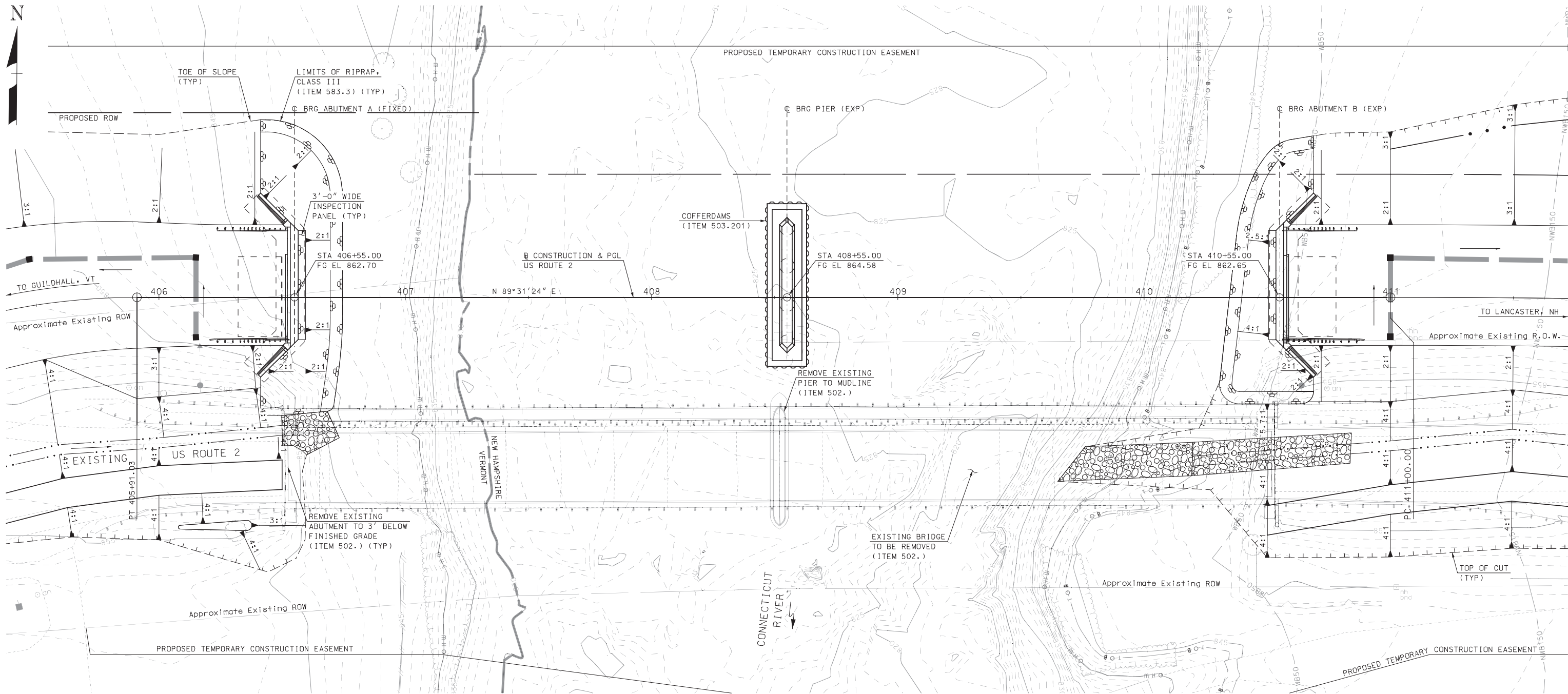


CONSTRUCTION NOTES

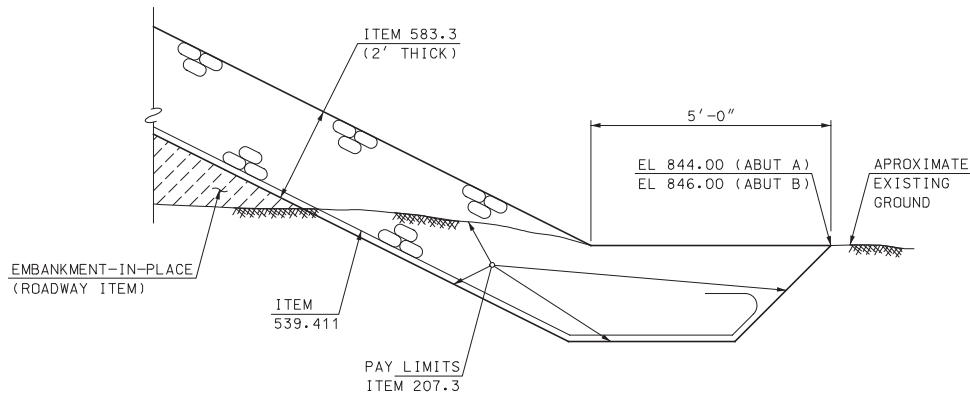


REVISION DATE		STATE OF NEW HAMPSHIRE			
9-1-2016		DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
HTA PROJECT NO.		MODEL		DGN	
092558.01		SYM02		161551SS	
STATE PROJECT NO.		SHEET NO.		TOTAL SHEETS	
16155		3		11	





PLAN
SCALE: 1" = 20'

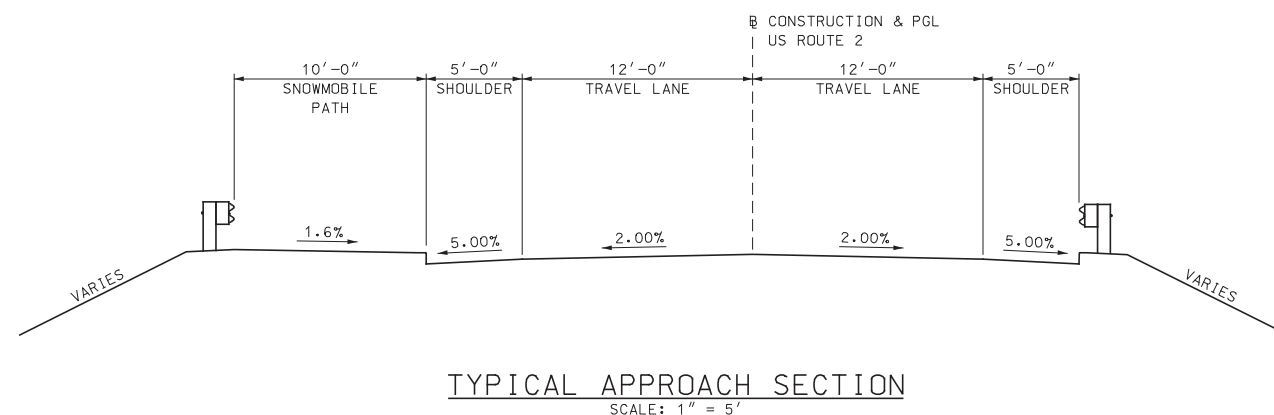


RIPRAP KEY DETAIL
SCALE: 1/2" = 1'-0"

Hoyle, Tanner & Associates, Inc.

HTA PROJECT NO.	MODEL
092558.01	16155Siteplan
SUBDIRECTORY	DGN LOCATOR
XX	16155Siteplan
	SHEET SCALE
	AS SHOWN

STATE OF NEW HAMPSHIRE											
DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN											
TOWN	LANCASTER, NH AND GUILDHALL, VT		BRIDGE NO.		112/130		STATE PROJECT		16155		
LOCATION										US ROUTE 2 OVER THE CONNECTICUT RIVER	
SITE PLAN										BRIDGE SHEET	
REVISIONS AFTER PROPOSAL			BY		DATE		BY		DATE		4 OF 58
			DESIGNED		RSW 01/18		CHECKED		EGW 01/18		FILE NUMBER
			DRAWN		PBD 01/18		CHECKED		JCR 01/18		132-4-1
			QUANTITIES				CHECKED				TOTAL SHEETS
			ISSUE DATE				FEDERAL PROJECT NO.		SHEET NO.		
			REV. DATE						4		11



<div>Hoyle, Tanner & Associates, Inc.</div>			STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN										
			TOWN LANCASTER, NH AND GUILDHALL, VT					BRIDGE NO. 112/130		STATE PROJECT 16155			
			LOCATION US ROUTE 2 OVER THE CONNECTICUT RIVER										
			ROADWAY PROFILE AND APPROACH SECTION									BRIDGE SHEET	
			REVISIONS AFTER PROPOSAL									5 OF 58	
HTA PROJECT NO. 092558.01			MODEL 1615SRwyPro			DESIGNED RSW		DATE 01/18	CHECKED EGW		DATE 01/18	FILE NUMBER	
						DRAWN PBD		01/18	CHECKED JCR		01/18	132-41	
						QUANTITIES			CHECKED				
SUBDIRECTORY XX			_DGN LOCATOR 16155RwyPro			SHEET SCALE AS SHOWN		ISSUE DATE		FEDERAL PROJECT NO.		SHEET NO.	TOTAL SHEETS
								REV. DATE				5	11

EROSION CONTROL STRATEGIES

1. ENVIRONMENTAL COMMITMENTS:
- 1.1. THESE GUIDELINES DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH ANY CONTRACT PROVISIONS, OR APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
- 1.2. THIS PROJECT WILL BE SUBJECT TO THE US EPA’S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER CONSTRUCTION GENERAL PERMIT AS ADMINISTERED BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA). THIS PROJECT IS SUBJECT TO REQUIREMENTS IN THE MOST RECENT CONSTRUCTION GENERAL PERMIT (CGP).
- 1.3. THE CONTRACTOR’S ATTENTION IS DIRECTED TO THE NHDES WETLAND PERMIT, THE US ARMY CORPS OF ENGINEERS PERMIT, WATER QUALITY CERTIFICATION AND THE SPECIAL ATTENTION ITEMS INCLUDED IN THE CONTRACT DOCUMENTS.
- 1.4. ALL STORM WATER, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE NEW HAMPSHIRE STORMWATER MANUAL, VOLUME 3, EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION (DECEMBER 2008) (BMP MANUAL) AVAILABLE FROM THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NHDES).
- 1.5. THE CONTRACTOR SHALL COMPLY WITH RSA 485-A:17, AND ALL, PUBLISHED NHDES ALTERATION OF TERRAIN ENV-WQ 1500 REQUIREMENTS (HTTP://DES.NH.GOV/ORGANIZATION/COMMISSIONER/LEGAL/RULES/INDEX.HTM)
- 1.6. THE CONTRACTOR IS DIRECTED TO REVIEW AND COMPLY WITH SECTION 107.1 OF THE CONTRACT AS IT REFERS TO SPILLAGE, AND ALSO WITH REGARDS TO EROSION, POLLUTION, AND TURBIDITY PRECAUTIONS.
2. STANDARD EROSION CONTROL SEQUENCING APPLICABLE TO ALL CONSTRUCTION PROJECTS:
- 2.1. PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH DISTURBING ACTIVITIES. PERIMETER CONTROLS AND STABILIZED CONSTRUCTION EXITS SHALL BE INSTALLED AS SHOWN IN THE BMP MANUAL AND AS DIRECTED BY THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARER.
- 2.2. EROSION, SEDIMENTATION CONTROL MEASURES AND INFILTRATION BASINS SHALL BE CLEANED, REPLACED AND AUGMENTED AS NECESSARY TO PREVENT SEDIMENTATION BEYOND PROJECT LIMITS THROUGHOUT THE PROJECT DURATION.
- 2.3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT AND SECTION 645 OF THE NHDOT SPECIFICATIONS FOR ROAD AND BRIDGES CONSTRUCTION.
- 2.4. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
- (A) BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
- (B) A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
- (C) A MINIMUM OF 3” OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP-RAP HAS BEEN INSTALLED;
- (D) TEMPORARY SLOPE STABILIZATION CONFORMING TO TABLE 1 HAS BEEN PROPERLY INSTALLED
- 2.5. ALL STOCKPILES SHALL BE CONTAINED WITH A PERIMETER CONTROL. IF THE STOCKPILE IS TO REMAIN UNDISTURBED FOR MORE THAN 14 DAYS, MULCHING WILL BE REQUIRED.
- 2.6. A WATER TRUCK SHALL BE AVAILABLE TO CONTROL EXCESSIVE DUST AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR.
- 2.7. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL REMAIN UNTIL THE AREA HAS BEEN PERMANENTLY STABILIZED.
- 2.8. CONSTRUCTION PERFORMED ANY TIME BETWEEN NOVEMBER 30” AND MAY 1” OF ANY YEAR SHALL BE CONSIDERED WINTER CONSTRUCTION AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS.
- (A) ALL PROPOSED VEGETATED AREAS WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15”, OR WHICH ARE DISTURBED AFTER OCTOBER 15”, SHALL BE STABILIZED IN ACCORDANCE WITH TABLE 1.
- (B) ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15”, OR WHICH ARE DISTURBED AFTER OCTOBER 15”, SHALL BE STABILIZED TEMPORARILY WITH STONE OR IN ACCORDANCE WITH TABLE 1.
- (C) AFTER NOVEMBER 30” INCOMPLETE ROAD SURFACES, WHERE WORK HAS STOPPED FOR THE SEASON, SHALL BE PROTECTED IN ACCORDANCE WITH TABLE 1.
- (D) WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE PROJECT IS WITHOUT STABILIZATION AT ONE TIME, UNLESS A WINTER CONSTRUCTION PLAN HAS BEEN APPROVED BY NHDOT THAT MEETS THE REQUIREMENTS OF ENV-WQ 1505.02 AND ENV-WQ 1505.05.
- (E) A SWPPP AMENDMENT SHALL BE SUBMITTED TO THE DEPARTMENT, FOR APPROVAL, ADDRESSING COLD WEATHER STABILIZATION (ENV-WQ 1505.05) AND INCLUDING THE REQUIREMENTS OF NO LESS THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF WORK SCHEDULED AFTER NOVEMBER 30”.

GENERAL CONSTRUCTION PLANNING AND SELECTION OF STRATEGIES TO CONTROL EROSION AND SEDIMENT ON HIGHWAY CONSTRUCTION PROJECTS

3. PLAN ACTIVITIES TO ACCOUNT FOR SENSITIVE SITE CONDITIONS:
- 3.1. CLEARLY FLAG AREAS TO BE PROTECTED IN THE FIELD AND PROVIDE CONSTRUCTION BARRIERS TO PREVENT TRAFFICKING OUTSIDE OF WORK AREAS.
- 3.2. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS.
- 3.3. PROTECT AND MAXIMIZE EXISTING NATIVE VEGETATION AND NATURAL FOREST BUFFERS BETWEEN CONSTRUCTION ACTIVITY AND SENSITIVE AREAS.
- 3.4. WHEN WORK IS PERFORMED IN AND NEAR WATER COURSES, STREAM FLOW DIVERSION METHODS SHALL BE IMPLEMENTED PRIOR TO ANY EXCAVATION OR FILLING.
- 3.5. WHEN WORK IS PERFORMED WITHIN 50 FEET OF SURFACE WATERS (WETLAND, OPEN WATER OR FLOWING WATER), PERIMETER CONTROL SHALL BE ENHANCED CONSISTENT WITH SECTION 2-1.2.1. OF THE 2012 NPDES CONSTRUCTION GENERAL PERMIT.
4. MINIMIZE THE AMOUNT OF EXPOSED SOIL:
- 4.1. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS. MINIMIZE THE AREA OF EXPOSED SOIL AT ANY ONE TIME. PHASING SHALL BE USED TO REDUCE THE AMOUNT AND DURATION OF SOIL EXPOSED TO THE ELEMENTS AND VEHICLE TRACKING.
- 4.2. UTILIZE TEMPORARY MULCHING OR PROVIDE ALTERNATE TEMPORARY STABILIZATION ON EXPOSED SOILS IN ACCORDANCE WITH TABLE 1.
- 4.3. THE MAXIMUM AMOUNT OF DISTURBED EARTH SHALL NOT EXCEED A TOTAL OF 5 ACRES FROM MAY 1” THROUGH NOVEMBER 30”, OR EXCEED ONE ACRE DURING WINTER MONTHS, UNLESS THE CONTRACTOR DEMONSTRATES TO THE DEPARTMENT THAT THE ADDITIONAL AREA OF DISTURBANCE IS NECESSARY TO MEET THE CONTRACTORS CRITICAL PATH METHOD SCHEDULE (CPM), AND THE CONTRACTOR HAS ADEQUATE RESOURCES AVAILABLE TO ENSURE THAT ENVIRONMENTAL COMMITMENTS WILL BE MET.
5. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT:
- 5.1. DIVERT OFF SITE RUNOFF OR CLEAN WATER AWAY FROM THE CONSTRUCTION ACTIVITY TO REDUCE THE VOLUME THAT NEEDS TO BE TREATED ON SITE.
- 5.2. DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM DISTURBED AREAS, SLOPES, AND AROUND ACTIVE WORK AREAS AND TO A STABILIZED OUTLET LOCATION.
- 5.3. CONSTRUCT IMPERMEABLE BARRIERS AS NECESSARY TO COLLECT OR DIVERT CONCENTRATED FLOWS FROM WORK OR DISTURBED AREAS.
- 5.4. STABILIZE, TO APPROPRIATE ANTICIPATED VELOCITIES, CONVEYANCE CHANNELS OR PUMPING SYSTEMS NEEDED TO CONVEY CONSTRUCTION STORMWATER TO BASINS AND DISCHARGE LOCATIONS PRIOR TO USE.
- 5.5. DIVERT OFF-SITE WATER THROUGH THE PROJECT IN AN APPROPRIATE MANNER SO NOT TO DISTURB THE UPSTREAM OR DOWNSTREAM SOILS, VEGETATION OR HYDROLOGY BEYOND THE PERMITTED AREA.
6. PROTECT SLOPES:
- 6.1. INTERCEPT AND DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM UNPROTECTED AND NEWLY ESTABLISHED AREAS AND SLOPES TO A STABILIZED OUTLET OR CONVEYANCE.
- 6.2. CONSIDER HOW GROUNDWATER SEEPAGE ON CUT SLOPES MAY IMPACT SLOPE STABILITY AND INCORPORATE APPROPRIATE MEASURES TO MINIMIZE EROSION.
- 6.3. CONVEY STORMWATER DOWN THE SLOPE IN A STABILIZED CHANNEL OR SLOPE DRAIN.
- 6.4. THE OUTER FACE OF THE FILL SLOPE SHOULD BE IN A LOOSE RUFFLED CONDITION PRIOR TO TURF ESTABLISHMENT. TOPSOIL OR HUMUS LAYERS SHALL BE TRACKED UP AND DOWN THE SLOPE, DISKED, HARROWED, DRAGGED WITH A CHAIN OR MAT, MACHINE-RAKED, OR HAND-WORKED TO PRODUCE A RUFFLED SURFACE.
7. ESTABLISH STABILIZED CONSTRUCTION EXITS:
- 7.1. INSTALL AND MAINTAIN CONSTRUCTION EXITS, ANYWHERE TRAFFIC LEAVES A CONSTRUCTION SITE ONTO A PUBLIC RIGHT-OF-WAY.
- 7.2. SWEEP ALL CONSTRUCTION RELATED DEBRIS AND SOIL FROM THE ADJACENT PAVED ROADWAYS AS NECESSARY.
8. PROTECT STORM DRAIN INLETS:
- 8.1. DIVERT SEDIMENT LADEN WATER AWAY FROM INLET STRUCTURES TO THE EXTENT POSSIBLE.
- 8.2. INSTALL SEDIMENT BARRIERS AND SEDIMENT TRAPS AT INLETS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM.
- 8.3. CLEAN CATCH BASINS, DRAINAGE PIPES, AND CULVERTS IF SIGNIFICANT SEDIMENT IS DEPOSITED.
- 8.4. DROP INLET SEDIMENT BARRIERS SHOULD NEVER BE USED AS THE PRIMARY MEANS OF SEDIMENT CONTROL AND SHOULD ONLY BE USED TO PROVIDE AN ADDITIONAL LEVEL OF PROTECTION TO STRUCTURES AND DOWN-GRADIENT SENSITIVE RECEPTORS.
9. SOIL STABILIZATION:
- 9.1. WITHIN THREE DAYS OF THE LAST ACTIVITY IN AN AREA, ALL EXPOSED SOIL AREAS, WHERE CONSTRUCTION ACTIVITIES ARE COMPLETE, SHALL BE STABILIZED.
- 9.2. IN ALL AREAS, TEMPORARY SOIL STABILIZATION MEASURES SHALL BE APPLIED IN ACCORDANCE WITH THE STABILIZATION REQUIREMENTS (SECTION 2-2) OF THE 2012 CGP. (SEE TABLE 1 FOR GUIDANCE ON THE SELECTION OF TEMPORARY SOIL STABILIZATION MEASURES.)
- 9.3. EROSION CONTROL SEED MIX SHALL BE SOWN IN ALL INACTIVE CONSTRUCTION AREAS THAT WILL NOT BE PERMANENTLY SEEDED WITHIN TWO WEEKS OF DISTURBANCE AND PRIOR TO SEPTEMBER 15, OF ANY GIVEN YEAR, IN ORDER TO ACHIEVE VEGETATIVE STABILIZATION PRIOR TO THE END OF THE GROWING SEASON.
- 9.4. SOIL TACKIFIERS MAY BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER’S SPECIFICATIONS AND REAPPLIED AS NECESSARY TO MINIMIZE SOIL AND MULCH LOSS UNTIL PERMANENT VEGETATION IS ESTABLISHED.
10. RETAIN SEDIMENT ON-SITE AND CONTROL DEWATERING PRACTICES:
- 10.1. TEMPORARY SEDIMENT BASINS (CGP-SECTION 2-1.3.2) OR SEDIMENT TRAPS (ENV-WQ 1506.10) SHALL BE SIZED TO RETAIN, ON SITE, THE VOLUME OF A 2-YEAR 24-HOUR STORM EVENT FOR ANY AREA OF DISTURBANCE OR 3,600 CUBIC FEET OF STORMWATER RUNOFF PER ACRE OF DISTURBANCE, WHICHEVER IS GREATER. TEMPORARY SEDIMENT BASINS USED TO TREAT STORMWATER RUNOFF FROM AREAS GREATER THAN 5-ACRES OF DISTURBANCE SHALL BE SIZED TO ALSO CONTROL STORMWATER RUNOFF FROM A 10-YEAR 24 HOUR STORM EVENT. ON-SITE RETENTION OF THE 10-YEAR 24-HOUR EVENT IS NOT REQUIRED.
- 10.2. CONSTRUCT AND STABILIZE DEWATERING INFILTRATION BASINS PRIOR TO ANY EXCAVATION THAT MAY REQUIRE DEWATERING.
- 10.3. TEMPORARY SEDIMENT BASINS OR TRAPS SHALL BE PLACED AND STABILIZED AT LOCATIONS WHERE CONCENTRATED FLOW (CHANNELS AND PIPES) DISCHARGE TO THE SURROUNDING ENVIRONMENT FROM AREAS OF UNSTABILIZED EARTH DISTURBING ACTIVITIES.

11. ADDITIONAL EROSION AND SEDIMENT CONTROL GENERAL PRACTICES:
- 11.1. USE TEMPORARY MULCHING, PERMANENT MULCHING, TEMPORARY VEGETATIVE COVER, AND PERMANENT VEGETATIVE COVER TO REDUCE THE NEED FOR DUST CONTROL. USE MECHANICAL SWEEPERS ON PAVED SURFACES WHERE NECESSARY TO PREVENT DUST BUILDUP. APPLY WATER, OR OTHER DUST INHIBITING AGENTS OR TACKIFIERS, AS APPROVED BY THE NHDES.
- 11.2. ALL STOCKPILES SHALL BE CONTAINED WITH TEMPORARY PERIMETER CONTROLS. INACTIVE SOIL STOCKPILES SHOULD BE PROTECTED WITH SOIL STABILIZATION MEASURES (TEMPORARY EROSION CONTROL SEED MIX AND MULCH, SOIL BINDER) OR COVERED WITH ANCHORED TARPS.
- 11.3. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED IN ACCORDANCE WITH SECTION 645 OF NHDOT SPECIFICATIONS, WEEKLY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.25 IN. OF RAIN PER 24-HOUR PERIOD. EROSION AND SEDIMENT CONTROL MEASURES WILL ALSO BE INSPECTED IN ACCORDANCE WITH THE GUIDANCE MEMO FROM THE NHDES CONTAINED WITHIN THE CONTRACT PROPOSAL AND THE EPA CONSTRUCTION GENERAL PERMIT.
- 11.4. THE CONTRACTOR SHOULD UTILIZE STORM DRAIN INLET PROTECTION TO PREVENT SEDIMENT FROM ENTERING A STORM DRAINAGE SYSTEM PRIOR TO THE PERMANENT STABILIZATION OF THE CONTRIBUTING DISTURBED AREA.
- 11.5. PERMANENT STABILIZATION MEASURES WILL BE CONSTRUCTED AND MAINTAINED IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS TO STABILIZE AREAS. VEGETATIVE STABILIZATION SHALL NOT BE CONSIDERED PERMANENTLY STABILIZED UNTIL VEGETATIVE GROWTH COVERS AT LEAST 85% OF THE DISTURBED AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL FOR ONE YEAR AFTER PROJECT COMPLETION.
- 11.6. CATCH BASINS: CARE SHALL BE TAKEN TO ENSURE THAT SEDIMENTS DO NOT ENTER ANY EXISTING CATCH BASINS DURING CONSTRUCTION. THE CONTRACTOR SHALL PLACE TEMPORARY STONE INLET PROTECTION OVER INLETS IN AREAS OF SOIL DISTURBANCE THAT ARE SUBJECT TO SEDIMENT CONTAMINATION.
- 11.7. TEMPORARY AND PERMANENT DITCHES SHALL BE CONSTRUCTED, STABILIZED AND MAINTAINED IN A MANNER THAT WILL MINIMIZE SCOUR. TEMPORARY AND PERMANENT DITCHES SHALL BE DIRECTED TO DRAIN TO SEDIMENT BASINS OR STORM WATER COLLECTION AREAS.
- 11.8. WINTER EXCAVATION AND EARTHWORK ACTIVITIES NEED TO BE LIMITED IN EXTENT AND DURATION, TO MINIMIZE POTENTIAL EROSION AND SEDIMENTATION IMPACTS. THE AREA OF EXPOSED SOIL SHALL BE LIMITED TO ONE ACRE, OR THAT WHICH CAN BE STABILIZED AT THE END OF EACH DAY UNLESS A WINTER CONSTRUCTION PLAN, DEVELOPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST, IS REVIEWED AND APPROVED BY THE DEPARTMENT.
- 11.9. CHANNEL PROTECTION MEASURES SHALL BE SUPPLEMENTED WITH PERIMETER CONTROL MEASURES WHEN THE DITCH LINES OCCUR AT THE BOTTOM OF LONG FILL SLOPES. THE PERIMETER CONTROLS SHALL BE INSTALLED ON THE FILL SLOPE TO MINIMIZE THE POTENTIAL FOR FILL SLOPE SEDIMENT DEPOSITS IN THE DITCH LINE.

BEST MANAGEMENT PRACTICES (BMP) BASED ON AMOUNT OF OPEN CONSTRUCTION AREA

12. STRATEGIES SPECIFIC TO OPEN AREAS LESS THAN 5 ACRES:
- 12.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500; ALTERATION OF TERRAIN FOR CONSTRUCTION AND USE ALL CONVENTIONAL BMP STRATEGIES.
- 12.2. SLOPES STEEPER THAN 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING.
- 12.3. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT ALONE.
- 12.4. AREAS WHERE HAUL ROADS ARE CONSTRUCTED AND STORMWATER CANNOT BE TREATED THE DEPARTMENT WILL CONSIDER INFILTRATION.
- 12.5. FOR HAUL ROADS ADJACENT TO SENSITIVE ENVIRONMENTAL AREAS OR STEEPER THAN 5%, THE DEPARTMENT WILL CONSIDER USING EROSION STONE, CRUSHED GRAVEL, OR CRUSHED STONE BASE TO HELP MINIMIZE EROSION ISSUES.
- 12.6. ALL AREAS THAT CAN BE STABILIZED SHALL BE STABILIZED PRIOR TO OPENING UP NEW TERRITORY.
- 12.7. DETENTION BASINS SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE A 2 YEAR STORM EVENT.
13. STRATEGIES SPECIFIC TO OPEN AREAS BETWEEN 5 AND 10 ACRES:
- 13.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES WILL BE UTILIZED.
- 13.2. DETENTION BASINS WILL BE CONSTRUCTED TO ACCOMMODATE THE 2-YEAR 24-HOUR STORM EVENT AND CONTROL A 10-YEAR 24-HOUR STORM EVENT.
- 13.3. SLOPES STEEPER THAN A 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS. OTHER ALTERNATIVE MEASURES, SUCH AS BONDED FIBER MATRIXES (BFMS) OR FLEXIBLE GROWTH MEDIUMS (FGMS) MAY BE UTILIZED, IF MEETING THE NHDES APPROVALS AND REGULATIONS.
- 13.4. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS.
14. STRATEGIES SPECIFIC TO OPEN AREAS OVER 10 ACRES:
- 14.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES AND BETWEEN 5 AND 10 ACRES WILL BE UTILIZED.
- 14.2. THE DEPARTMENT ANTICIPATES THAT SOIL BINDERS WILL BE NEEDED ON ALL SLOPES STEEPER THAN 3:1, IN ORDER TO MINIMIZE EROSION AND REDUCE THE AMOUNT OF SEDIMENT IN THE STORMWATER TREATMENT BASINS.
- 14.3. THE CONTRACTOR WILL BE REQUIRED TO HAVE AN APPROVED DESIGN IN ACCORDANCE WITH ENV-WQ 1506.12 FOR AN ACTIVE FLOCCULANT TREATMENT SYSTEM TO TREAT AND RELEASE WATER CAPTURED IN STORM WATER BASINS. THE CONTRACTOR SHALL ALSO RETAIN THE SERVICES OF AN ENVIRONMENTAL CONSULTANT WHO HAS DEMONSTRATED EXPERIENCE IN THE DESIGN OF FLOCCULANT TREATMENT SYSTEMS. THE CONSULTANT WILL ALSO BE RESPONSIBLE FOR THE IMPLEMENTATION AND MONITORING OF THE SYSTEM.

TABLE 1
GUIDANCE ON SELECTING TEMPORARY SOIL STABILIZATION MEASURES

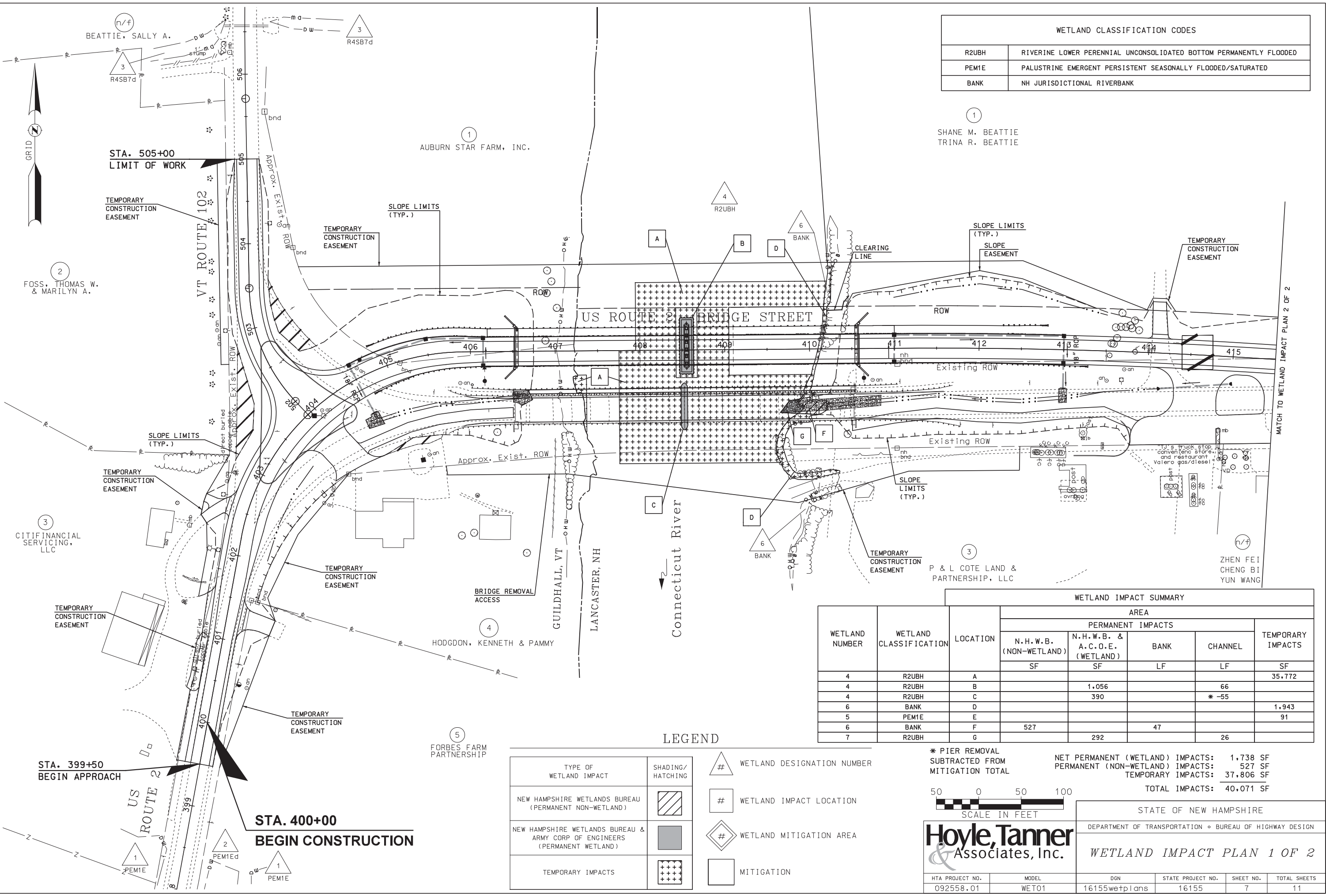
APPLICATION AREAS	DRY MULCH METHODS				HYDRAULICALLY APPLIED MULCHES ²				ROLLED EROSION CONTROL BLANKETS ³			
	HMT	WC	SG	CB	HM	SMM	BFM	FRM	SNSB	DNSB	DNSCB	DNCB
SLOPES ¹												
STEEPER THAN 2:1	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
2:1 SLOPE	YES ¹	YES ¹	YES	YES	NO	NO	YES	YES	NO	YES	YES	YES
3:1 SLOPE	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	NO
4:1 SLOPE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
WINTER STABILIZATION	4T/AC	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
CHANNELS												
LOW FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
HIGH FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES

ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE
HMT	HAY MULCH & TACK	HM	HYDRAULIC MULCH	SNSB	SINGLE NET STRAW BLANKET
WC	WOOD CHIPS	SMM	STABILIZED MULCH MATRIX	DNSB	DOUBLE NET STRAW BLANKET
SG	STUMP GRINDINGS	BFM	BONDED FIBER MATRIX	DNSCB	2 NET STRAW-COCONUT BLANKET
CB	COMPOST BLANKET	FRM	FIBER REINFORCED MEDIUM	DNCB	2 NET COCONUT BLANKET

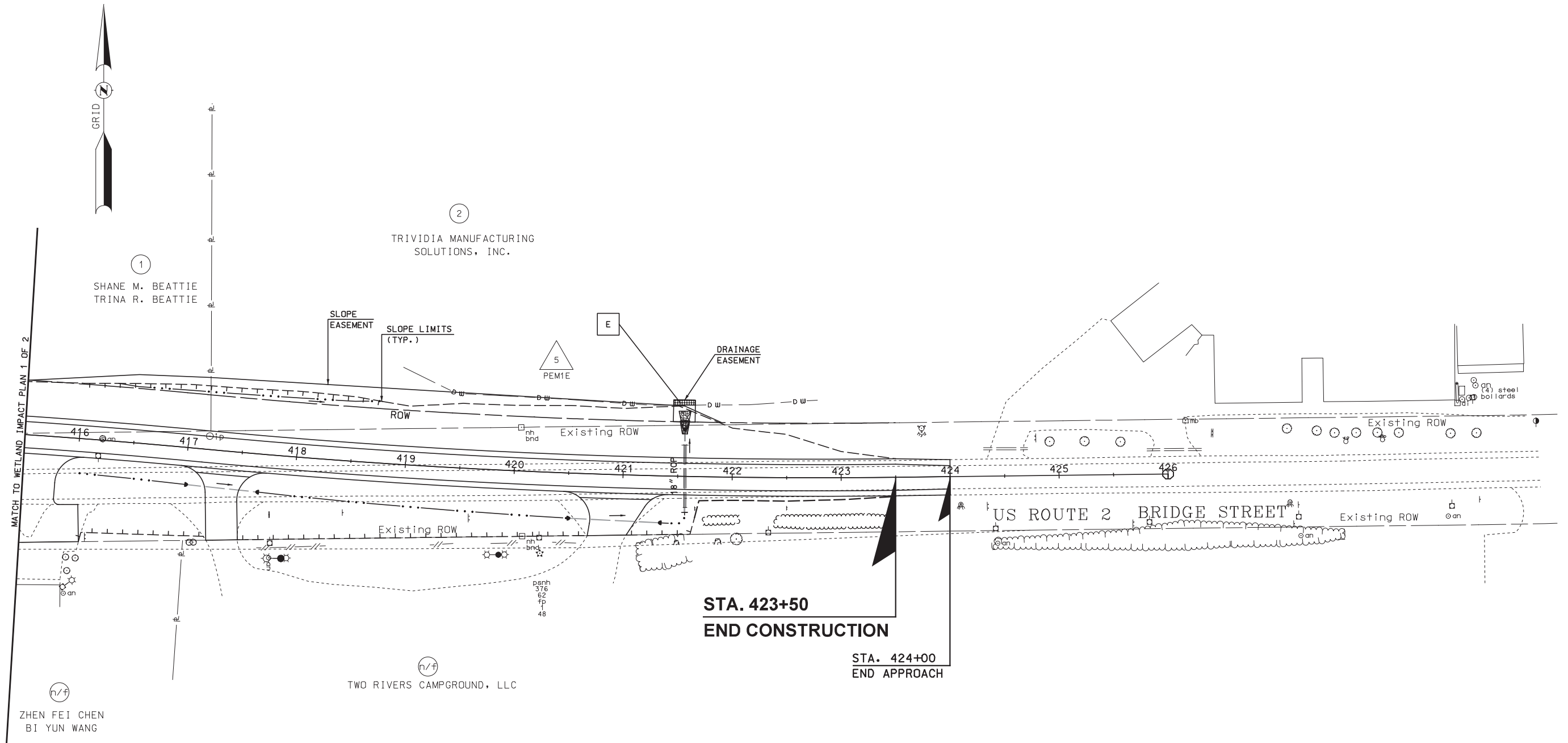
- NOTES:
1. ALL SLOPE STABILIZATION OPTIONS ASSUME A SLOPE LENGTH ≤10 TIMES THE HORIZONTAL DISTANCE COMPONENT OF THE SLOPE, IN FEET.
2. PRODUCTS CONTAINING POLYACRYLAMIDE (PAM) SHALL NOT BE APPLIED DIRECTLY TO OR WITHIN 100 FEET OF ANY SURFACE WATER WITHOUT PRIOR WRITTEN APPROVAL FROM THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES.
3. ALL EROSION CONTROL BLANKETS SHALL BE MADE WITH WILDLIFE FRIENDLY BIODEGRADABLE NETTING.

STATE OF NEW HAMPSHIRE			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
Hoyle, Tanner & Associates, Inc.			
EROSION CONTROL STRATEGIES AND STABILIZATION MATRIX			
REVISION DATE	HTA PROJECT NO.	MODEL	DGN
12-21-2015	092558.01	16155EROSTRAT	16155eropPlans
STATE PROJECT NO.		SHEET NO.	TOTAL SHEETS
16155		6	11

REVISIONS AFTER PROPOSAL		STATION		DATE		NUMBER	
SDR PROCESSED		NHDOT		DATE		10/8/2014	
NEW DESIGN		AGB		DATE		5/2018	
SHEET CHECKED		TMC		DATE		5/2018	
AS BUILT DETAILS				DATE			



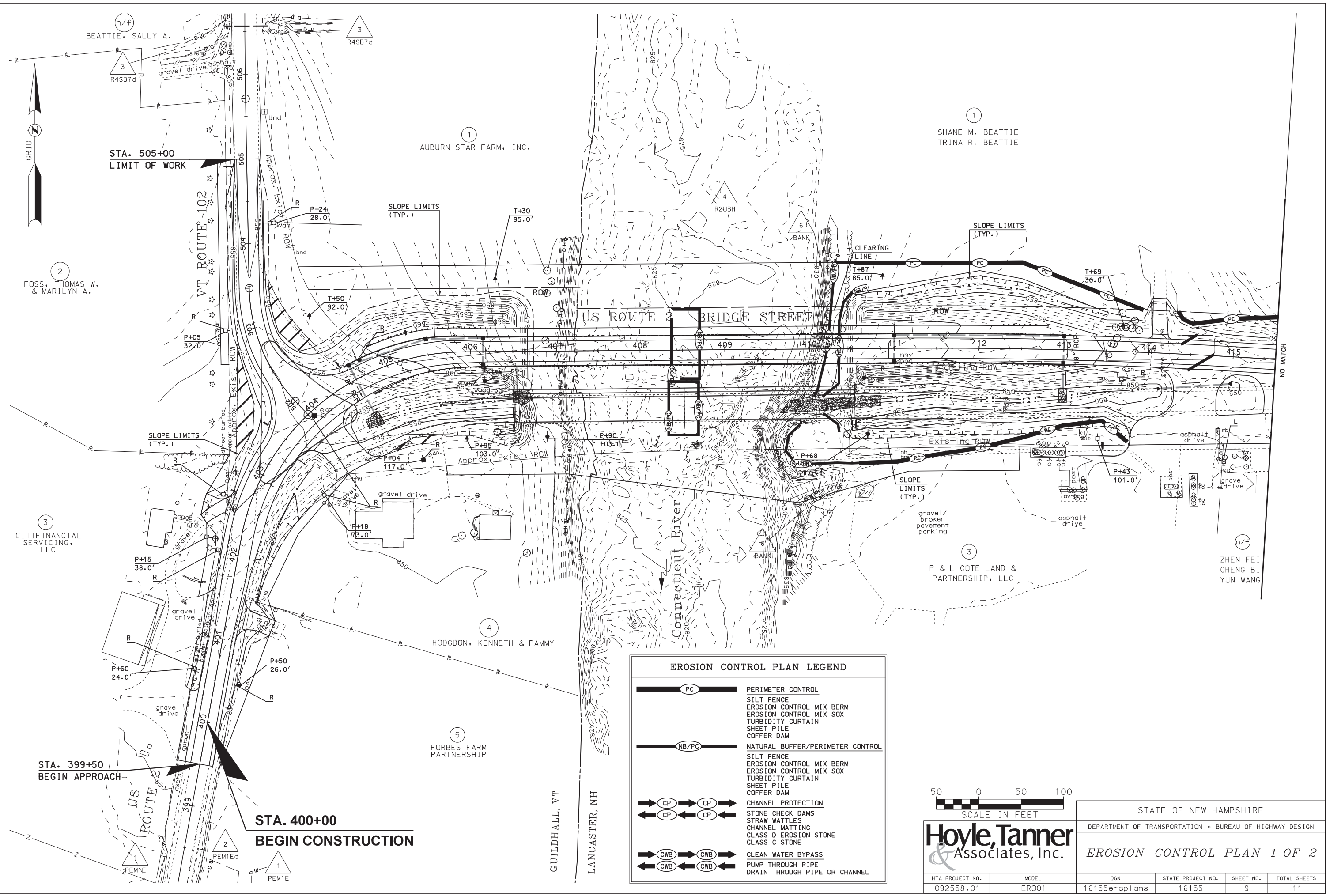
SDR PROCESSED	NH00T	DATE	10/8/2014
NEW DESIGN	JCC	DATE	5/2018
SHEET CHECKED	AGB/TMC	DATE	5/2018
AS BUILT DETAILS			
		REVISIONS AFTER PROPOSAL	
NUMBER	DATE	STATION	DESCRIPTION



Hoyle, Tanner
& Associates, Inc.

HTA PROJECT NO.	MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
092558.01	WET02	16155wetplans	16155	8	11

REVISIONS AFTER PROPOSAL		STATION		DATE		NUMBER	
SDR PROCESSED		NHDOT		DATE		10/8/2014	
NEW DESIGN		AGB		DATE		5/2018	
SHEET CHECKED		TMC		DATE		5/2018	
AS BUILT DETAILS				DATE			



EROSION CONTROL PLAN LEGEND

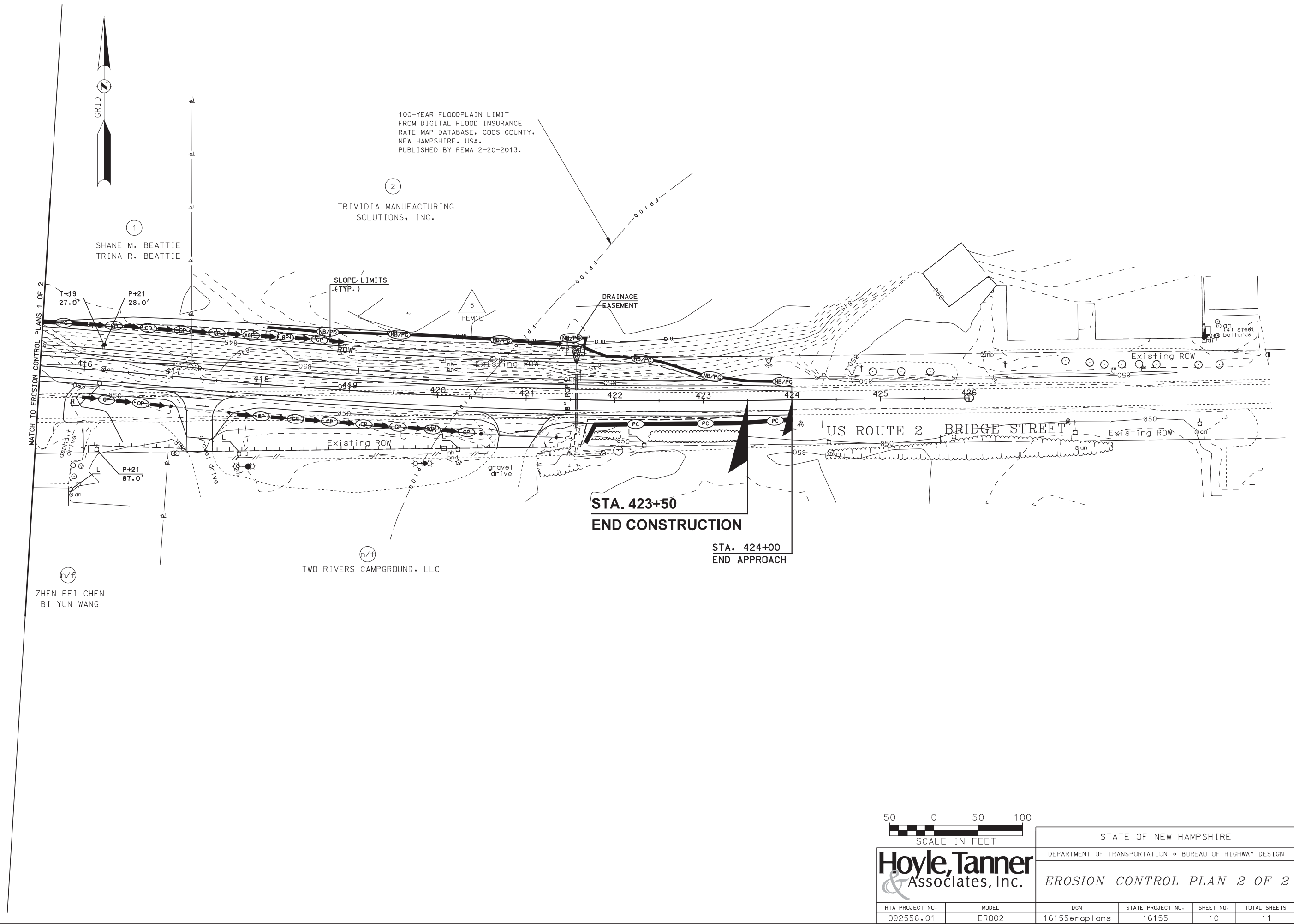
PC	PERIMETER CONTROL
	SILT FENCE
	EROSION CONTROL MIX BERM
	EROSION CONTROL MIX SOX
	TURBIDITY CURTAIN
	SHEET PILE
	COFFER DAM
NB/PC	NATURAL BUFFER/PERIMETER CONTROL
	SILT FENCE
	EROSION CONTROL MIX BERM
	EROSION CONTROL MIX SOX
	TURBIDITY CURTAIN
	SHEET PILE
	COFFER DAM
CP	CHANNEL PROTECTION
	STONE CHECK DAMS
	STRAW WATTLES
	CHANNEL MATTING
	CLASS D EROSION STONE
	CLASS C STONE
CWB	CLEAN WATER BYPASS
	PUMP THROUGH PIPE
	DRAIN THROUGH PIPE OR CHANNEL



Hoyle, Tanner & Associates, Inc.

STATE OF NEW HAMPSHIRE					
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN					
<i>EROSION CONTROL PLAN 1 OF 2</i>					
HTA PROJECT NO.	MODEL	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
092558.01	ER001	16155eroplans	16155	9	11

SDR PROCESSED	NHDOT	DATE	10/8/2014
NEW DESIGN	AGB	DATE	5/2018
SHEET CHECKED	TMC	DATE	5/2018
AS BUILT DETAILS			
		REVISIONS AFTER PROPOSAL	
NUMBER	DATE	STATION	DESCRIPTION



SDR PROCESSED		NHDOT	DATE		10/8/2014	
NEW DESIGN		JCC	DATE		5/2018	
SHEET CHECKED		AGB/TMC	DATE		5/2018	
		</				